THE FOUNDRY

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A Green Sand Job.

BY HENRY HANSEN.

WHEN we speak of molding in green sand, we understand thereby that the mold is not yet dried after being finished, and the same applies to green sand cores. A radical difference exists between dry and green sand molding, both in material used and treatment required. No rule can be given for all cases to make castings perfectly and economically.

Sometimes castings can be turned out most any way, without much difference in cost, and again, owing to certain conditions only one way is left to follow. When such is the case more judgment and experience is demanded. It may be said that generally, castings of considerable size require more skill in their production when made in green sand than when we can have the assistance of the drying oven.

The particular casting to a description of which this space is devoted, is well known to the molders in the Upper Peninsula of Michigan as the "washer." It has been said by many that a molder who could turn out these castings successfully, could make anything in green sand molding. This is of course an exageration, but the job embodies a large number of features well worth investigating, which can with a little modification be used to good advantage in other places.

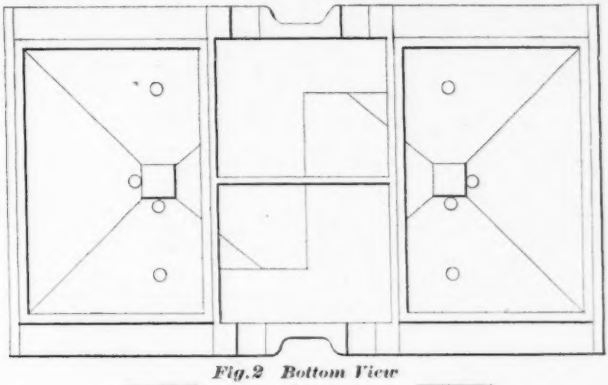


Fig. 2 Bottom View

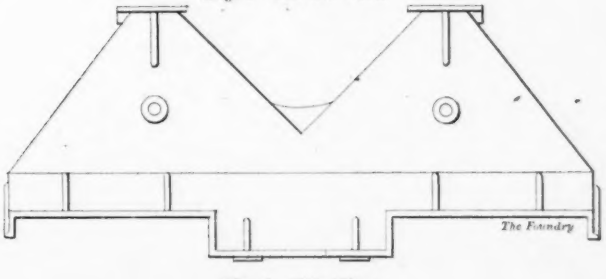


Fig. 1 Side View

It was the luck of the writer, among a good many others, to work on a large number of these castings. I said luck, for we can consider it no other way than lucky to be given a job that requires us to exercise our mental faculties, and

nothing should give a molder more pleasure than to be told to make some "ticklish piece" that would make him use his head. After accomplishing that kind of work we should certainly be better mechanics; for having done it, even should a complicated casting be lost a couple of times, the experience obtained would with the right man not be altogether lost.*

To avoid confusion none but the principal dimensions are given, enough to allow the reader to understand the size of the job. The contract for these castings stipulated that each casting should be paid for at the uniform rate of 1200 lbs.; if the weight was more or less, it was the firms loss or gain. Three-

of us have not had the foreman tell us to "be sure we had thickness enough, that iron was cheap." This may be a good way out of a difficulty, where but a few pounds of iron are involved, but when it comes to taking a contract on a close margin, a firm cannot afford to lose this way regularly. A lot of castings could very easily be made if we could use more iron in their construction, but when we have got to come down to the size, shape and weight of the designer, then the rule comes in.

The first of these castings were made with dry sand cores, this was found impracticable, as I am told that nearly all of them cracked, owing to the rapidity with which the iron would cool off and

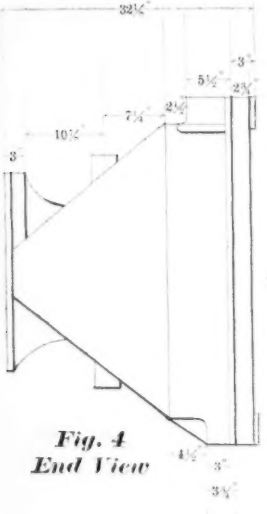


Fig. 4
End View

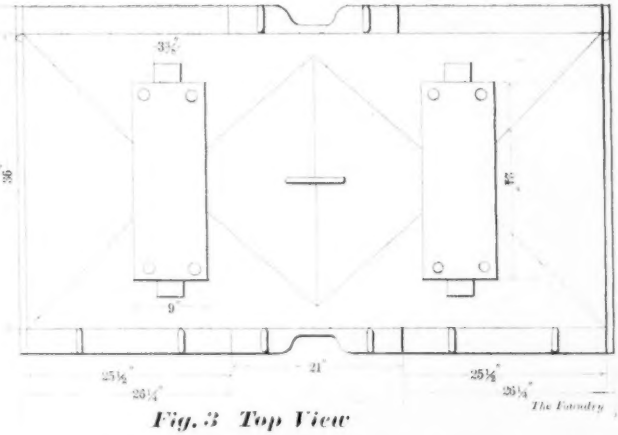


Fig. 3 Top View

eighths of an inch thickness was called for with the exception of a few ribs and flanges, where from ½" to 1" was the specified amount of metal.

This has been mentioned because right here was where the greatest difficulty lay in turning out this job profitably. If too light, it would fail to run and be a total loss, and if on the heavy side it was also a loss. Most molders are aware that a lot of castings, when but few of a kind are wanted, and especially when paid for by the pound, are turned out heavier than called for. Who

contract, the cores being of a solid material, refused to yield. Neither could the cores be removed quickly enough to save the casting. A few were all right, but so heavy that it was considered out of the question to continue the use of dry sand cores.

When it became apparent that the whole thing had to be made in green sand, the question arose, how to make a rigging that would allow of this being done in the most economical way. It is a common practice to break core arbors to get them out of castings, but this can not be called profitable when a large number of castings must be made, even if they can be made in a short time in

*In the illustrations shown, Fig. 1 gives a side view of the finished casting while Fig. 2 is a bottom view. Figs. 3 and 4 respectively are side and end views showing dimensions.

open sand, for to melt a couple of hundred pounds of iron daily to make arbors for a 1200-lb. casting makes quite an item at the end of six months. In addition, the blacksmith would also have to be called upon for hooks daily. The rigging shown in section, Fig. 5, and detail, Figs. 7, 8 and 9, was decided upon as being the most feasible to accomplish the work desired.

It will be noticed that everything required is very plain, no machine work being needed except to cut thread for hook H, in top of post, Fig. 8. This could also have been done away with by having a nut cast in.

These arbors were very easily and quickly adjusted and secured to the post by the keys VV, Fig. 5. As the shelf bing a core down is sometimes considerable. Often the blast is kept back and the whole shop is waiting simply because a core had to be filed down. With green sand cores we avoid such unpleasantness. Not only will the cores generally be of the size wanted, but should a little alteration be needed, it can be done much easier. As a rule it is claimed that cores can be made quicker in dry sand than in green, but in this case this was reversed. Besides the flour, fuel and extra handling saved, it also made a large difference in favor of using green sand altogether.

We may now consider some of the points connected with molding this piece, not so much because they were used in this particular case, but for the

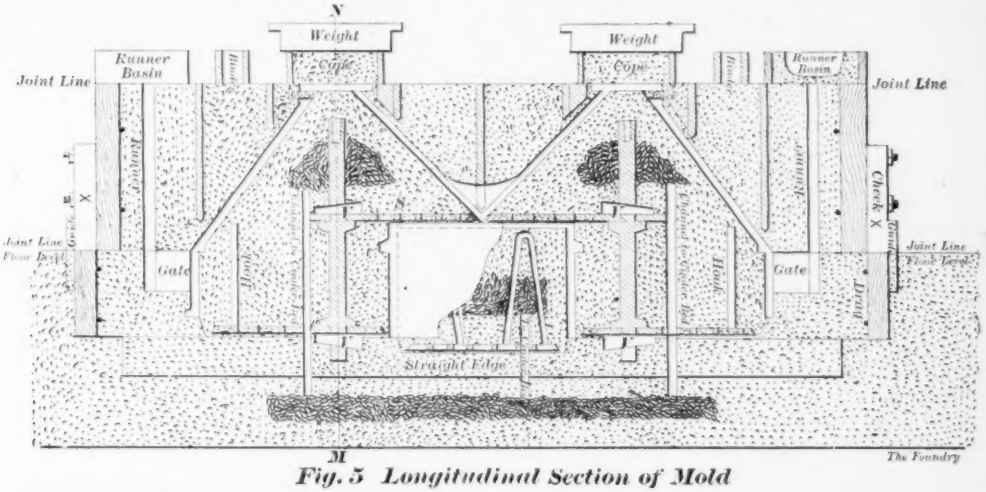


Fig. 5 Longitudinal Section of Mold

Fig. 7 (also shown at S, Fig. 5), was not wanted in its place until the core was rammed to the proper height, it will be seen how essential it was, that it should be made so as to be speedily yet safely connected. In removing the cores another advantage is offered in the easy way by which the arbors can be taken out, and everything be made ready to be used over again.

These cores were made in core boxes in the usual way, with the exception of the pyramidal portions which were swept up, a guide being placed on the core boxes. We all know how difficult it is to get dry sand cores of the kind described, which will be exactly the size called for. The labor involved in rub- reason they can be used to good advantage in a lot of other places.

Figs. 5 and 6 will show that the floor level is even with the top of drag, which was never removed from its position, the sand being shoveled out a couple of inches below the top of straight edges SS, Fig. 6. These were also left in the floor permanently, and were covered with band iron to protect them from being injured by shovels or vent wires. It was found to be faster by far, to sweep up the bottom of the mold by these straight edges, which conformed to the shape of the pattern than to turn it over; besides it gave a more solid foundation, a thing not to be overlooked in a job of this kind. All flanges were made loose

in pattern and drawn out of the mold sideways. In cross section Fig. 6, RR, is shown the manner of securing these places. On the same figure will also be seen what is called a false bar. The use of this is rendered necessary in order to secure a large body of sand underneath the feet and also to allow of the cheek being lifted off after casting. It was made in the shape shown, first: evil. By having a riser in same place as chaplet the chances are in favor of the casting being solid at that point, as any gases generated from the chaplet have got a chance to escape directly.

Ordinarily, molds which have no bottom board or plate under them are held down by weights altogether. This is a lot of trouble when it has to be done every day. Nine times out of ten a mol-

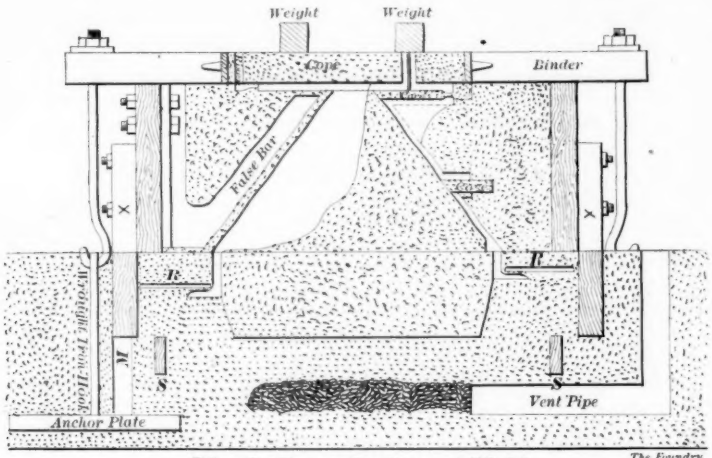
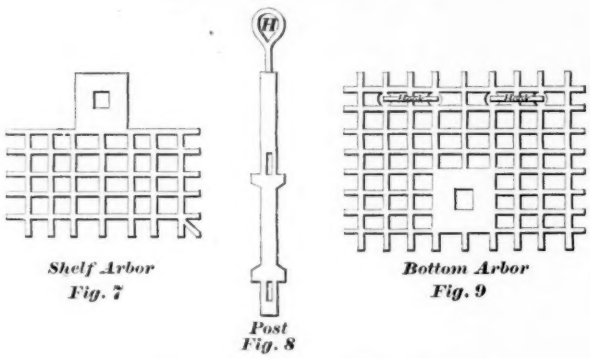


Fig. 6 Cross Section of Mold



Details of Arbor for End Cores
The Foundry

because of its lightness, which made it easy of handling, and second: that in this form it does not interfere materially with the ramming underneath to be done at this point, the bolts BB, being easy of access, are removed, when the flask can be lifted off without any trouble.

The way the chaplet T, Fig. 6, is used is worth noticing. In a lot of cases chaplets are a nuisance, but a necessary

der wants his weights but a short time before casting, and then everybody wants to use the crane; everything is in a hurry. The result is often seen to be a runout, or may be a core raised through not being properly wedged down. It is all the molder's fault when anything is bad, but should he be blamed when required to do an hour's work in fifteen minutes, and that most important part too, to secure everything?

In cross section, Fig. 6, is shown a way of avoiding weighting down that will commend itself for the ease with which everything can be put in place and screwed down. It consists of an anchor plate having a wrought iron hook cast in it. The larger we make this plate or the deeper we put it down in the floor, the greater resistance will it offer. A block, W, is shown placed between the drag and plate. This is to offer additional security from the plate being lifted upwards. Some molders will place a lot of pig iron on these plates when putting them down, but it should not be overlooked that the only increase in resistance offered is the difference in weight between iron and sand in the space displaced. A better and easier way is to get some rails or long clamps and letting them extend over both sides. The floor should be rammed up solid over these plates by doing this right. Nearly all molds that we care to make without having a bottom plate underneath them, when binders can be used, can be secured in this way.

It will be seen that the size of the cheek is smaller than that of the drag. This is done to avoid the ramming up of a large amount of sand not needed. The blocks X, bolted to cheek gives a bearing just as efficient for all purposes required, as if a cheek the full size of drag was used.

While none of the readers of this article may ever be called upon to make anything which would call for the exact rigging here employed, a general description of it has been given because, as a whole it is entitled to be classed with "Modern Foundry Practice."

The Missouri Malleable Iron Co., of St. Louis, has about 250 men engaged at its plant, and will put more men on the pay roll.

About 17 tons of iron is being melted daily at the plant of the Carondelet Foundry Co., at St. Louis, Mo. Seventy molders are employed there.

A large foundry plant has been established by Wm. Heath & Son at Lestershire, near Binghampton, N. Y. The plant is 120x40 feet in size, and is well fitted up with all appliances. The first casting was done a few weeks ago, and it was a success in every respect.

Making Cast Iron Mortars.

(CONTINUED FROM LAST MONTH.)

It is first wrapped with white hemp rope so as to cover all of the exterior surface in contact with the melted metal in the mold. Over this a coating of molding composition (called loam) is applied quite wet and wrapped with twine or wire to insure its adhering.

When the loam has partly dried another thin coating is applied and the surface rendered smooth and even by revolving the core in contact with a straight edge resting on the truck. The truck with the core is then rolled into the drying oven. When it is removed from the oven and a coating of the same wash again applied. It is again replaced in the oven until thoroughly dry, when it is removed and the journals taken out. The top is fitted with a water-tight cap so constructed as to receive the conducting pipes for the water, and is ready for use.

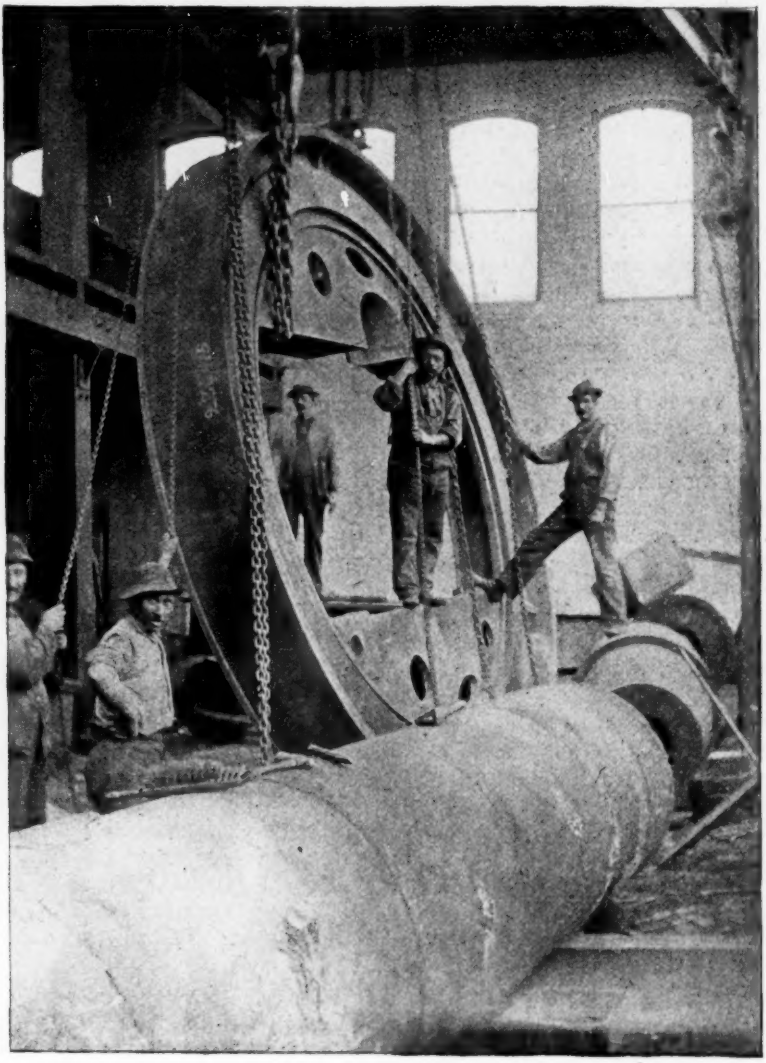
The *pit*, as usually constructed for the casting of guns on the Rodman plan, is cylindrical in form and is surrounded with a thick wall, built in offsets, affording supports for braces to steady the mold in position; grates are arranged around the circumference of the bottom for fires lighted immediately after the casting to retard the radiation of heat from the exterior of the mold. To retain the heat of the fires in the grates the mouth of the pit is covered with a close-fitting cover of boiler iron.

Casting.—The iron for the gun is melted in reverberatory air furnaces, two or three being sometimes required for casting the heavier guns. In these furnaces the draught is produced by high chimneys instead of a blast, which is used in the cupola furnace. The metal for what is termed a "heat" is all placed in the metal chamber before the fire is lighted. The fuel, bituminous coal, is placed on grate bars in the fuel chamber, and when ignited the flame passes through the metal chamber on its way to the chimney. The iron is melted by this flame without coming in contact with the solid carbon at all, unlike the cupola furnace where the fuel and iron are mixed together.

The different grades of iron to be used for the heat are weighed and piled in proper proportions in the metal chamber. Care should be taken to have the furnace perfectly dry throughout. When it has been out of use long enough to become damp it should be dried by a fire in the fire chamber before being charged.

When two or more furnaces are used in casting a gun the tap holes are connected by troughs with a reservoir called a mixing basin, in which the different charges are thoroughy mixed before entering the mold.

The furnace being charged and everything in readiness, the fires are started and regulated so that the iron in all will be melted or "down" as near as practicable at the same time. The length of time required to obtain complete fusion depends in great measure upon the state of the atmosphere and quantity of metal in the charge; it may vary from five to twelve hours.



When the charge is nearly down,

wooden poles or iron rods are inserted in holes provided for that purpose in the walls of the furnaces, and the melted metal frequently stirred or puddled to bring the unmelted lumps in contact with the flame. As soon as the charge of the furnace is ascertained to be fairly down specimens are taken out to determine whether the iron is sufficiently decarbonized or "high" to be in a proper condition for casting. These specimens are cast in sand molds and broken as soon as they become cold. The condition of the iron is indicated by the appearance of the fracture, and varies so much with different brands used that its determination is largely a matter of experience.

If the first specimens show insufficient decarbonization the iron is kept in fusion still longer and the puddling process is continued.

As the density and tensile strength of the iron depend in a great measure upon the highness to which it is brought, a correct decision is very important.

As soon as the melted iron in all the furnaces is found to be in proper condition for casting the furnaces are tapped simultaneously and the metal conducted by troughs to the mixing basin, where the several charges are thoroughly mixed. It then flows on through other troughs connecting with the side gates of the mold, and passing down, enters the mold by the branches. These branches connect with the side gates at regular intervals and are so constructed that the metal enters in a horizontal direction toward the axis of the mold cavity. The surface of the metal as it enters is stirred to prevent the scoria from lodging; care should be taken not to give it a "swirl," which throws the lightest metal in around the core where the heaviest and best should be. When the mold is filled the the tap holes of the furnaces are closed and the surface of the metal in the sinking head is covered with a layer of charcoal to prevent its chilling. For two or three hours after the casting, more metal is added at short intervals of time to feed the shrinkage by pouring from a ladle at the top of the mold as the surface sinks. The illustration on page— gives a good view of the operation of casting one of these mortars and the large audience present indicates the interest taken in the operation.

Cooling.—The water for cooling the gun is taken from a hydrant where the supply is constant and uniform. It is conducted into the core by means of a metalic tube which passes through a water tight joint in the center of the cap and extends to within a few inches of the bottom of the barrel. The water consequently passes into the core at the bottom and ascends until it reaches the escape pipe and is discharged.

The flow of the water commences as the furnaces are tapped, and is regulated to produce half an hour after the casting a certain change of temperature, about 25°, between entering and leaving the core. When this is affected the rate of flow remains constant until the core is removed.

As soon as possible after the casting the fire in the pit is kindled and kept up until the withdrawal of the core-barrel; it is allow to die out gradually. Meanwhile the mouth of the pit is kept closely covered.

When the change of temperature of the outflowing water has become constant or nearly so, the core-barrel is withdrawn. To effect this, it is sometimes necessary to largely increase the flow of water for a short time in order to contract the barrel enough to loosen it from the casting. As soon as this is effected the flow is stopped. The rope with which the barrel is wrapped takes fire from the heat of the casting and is consumed, leaving the barrel detached from the composition surrounding and allowing its withdrawal without difficulty.

As soon as the core-barrel is withdrawn the water is turned into the bore, being conveyed by the conducting pipe to the bottom and escaping by means of a tube cast into a gun head, entering the bore a few inches from the upper end of the casting. The rate of flow of the water through the bore is so regulated as to produce a change of about 100° between entering and leaving at half an hour after the removal of the barrel. It is then allowed to remain

constant until the gun becomes cool. The time occupied in cooling by this process varies from four to six days, according to the size of the gun.

Rough finishing—When the casting has become cool it is hoisted out from the pit, the flask being first taken off.

The Old School: Does It Pay?

BY THOS. D. WEST.

THERE are decidedly not as many good, reliable, skilled machinery molders to be had nowadays as the needs of the business demand.

Many foreman are compelled to tolerate poor machinery molders simply because they cannot secure the skilled mechanics they desire to insure the turning out of their work without loss, and where one man can turn out a good casting in new work on the first trial, there are more who can not. Of course many poor molders are improving themselves and learning every day, but at what a cost to the employer, as if given the chance it is likely to take ten years to accomplish what could be done in one if attempted through the medium of a proper apprentice's help.

In this there are two elements that have an important bearing on this much discussed subject. The first is, a young person grasps and imbibes knowledge quicker and remembers it longer than an adult, and in the second place, the simple matter of his being an apprentice means that he is under instructions and has teachers to give him attention, and the value of their knowledge and experience of years on a given point is of times expressed in four or five words almost unconsciously imparted. It is almost impossible to make the skilled, all-'round molder out of a man that could have been made out of the boy had he a good apprenticeship, and doing the best with each in either case.

I well know there are many excuses offered for the degeneration of the "old-school" machinery molder. A good many cry, "We do not have the opportunity; too much specialty business going on." We can isolate and fence them off, consider them as another realm, and with the present conditions of no apprentice system it would be about the same old song with the heavy work or jobbing foundries: "I do wish I could hire a few good, skilled molders; they are getting worse every day."

It is not going to remedy matters by ignoring the truth and setting up a visionary ghost to scare us from the road which could lead us onward to improvement. If we want to create or make good, reliable molders, there are opportunities today as well as in the past. We understand the principles of our trade much better, and instead of imitating, as had to be largely done ten years back, or so, we have many resources at hand to teach us the principles involved in our work, so instead of going it blind and doing thus and so because others do, we now have much information on various subjects that help us to reason from cause to effect and discover the reason for many things formerly not understood.

Give us back our system of apprenticeship combined with our advanced knowledge of the science and principles of our trade, and as a class we would soon surpass the molders of the old school. But we are not now clamoring for any improvement; what we want is their equal, and to secure that we must turn back and largely adopt or pick up the course of practice and discipline that made molders out of boys in the days gone by. "What was that?" I can imagine being asked by some youth. It was not a course, my young American buck, that with you is expected to receive favor, but as you have asked the question I will tell you as well as my memory will permit.

Let us start from the first day in the shop, which it is to be remembered is a jobbing or machinery shop, of which there are as many now as in days gone past.

You are about 15 years of age; we do not want you older. You are a boy, and will be such until you can prove by experience and ability that you can accomplish the work of a skilled man in the various lines. First kick.

The first six months of your time you will most likely be given up to the art

of sifting sand, waiting on molders and handling manure smoking hot. Second kick. The next six months will probably find you in the core room, where, if a good boy, you will be left to wrestle with paste, blacking, floor, core boxes and ovens for about a year. Third kick.

Two years having now passed, you will be considered eligible to enter the foundry as a buck to assist some good molder and perhaps occasionally the cupola man in any way they can use you, and if you do not mind your Ps and Qs in attending to your work carefully you may often be more ill-used than well-used. Fourth kick.

The period of buck is one of probation and depends altogether upon the tact and ability shown by you ere you are released and permitted to stand on your own merit, and if the latter is found fairly good you will be given a floor and $5 a week. Fifth kick.

You are now 18, but still considered a boy. Sixth kick.

With $5 a week you are to pitch in and make blow-ups and run-outs equal to some of our present molders, but them you must soon be an improvement over or else back as a buck you go. Seventh kick. Three years having now passed, you are sent to the loam work, if the shop has such, to spelter among mud and pounded manure, carry and lay bricks for six months at the end of which time, if you have been faithful to the call of your half dozen masters, you will be permitted to lay brick, daub on loam and finish the molds.

You are now 19, but still considered a "kid." Eighth kick. The fifth year now having approached you are pushed ahead one week on a large job with a helper, the next on a small one by yourself, and for $6 a week you are expected to do your level best.

The time for kicking has now passed and you see that if you do not improve the opportunities presented, you will be left in the race, so in dead earnest you achieve all you can. The foreman and molders encouraged by the taste, ability and earnestness you now show, do their level best to make this, your last year, as profitable to you as possible, and with wages not bothering your head you improve so from day to day that soon you are a molder and need but a few more years' experience to successfully compete with many of the old heads. Now, we await your answer; do you want to start in? You see you are left some privileges. You can make eight kicks in six years; if many more, "off goes your head," for, remember, there was no fooling or wasting time with boys having the "big head" in those days, as you were not considered a man until you could prove your ability, and if the apprentice commences at 15 he should have the needed experience when 21, and be able to enter manhood, knowing sufficient of your trade to command and give an equivalent for good wages. In four years he should see that if six years of apprenticeship did average only $6 per week it should, when combined with your four years' wages as journeyman at $18 per week, bring you out just exactly even with what you would have earned if you had served three years averaging $8, and seven years as a journeyman at $12 a week, which is fair wages for many of the machinery molders that are hired out these days in comparison to that earned by those who learned the business under the system of years gone by.

Figures should now show that ten years have been given in both cases and the amount of money received the same, and before going further I would ask what conclusion could be deducted from the above? Simply this—that every year you continue to work learning the business only increases the amount you will earn after you have that business learned.

A glance at the following figures will show more clearly my meaning and will serve to impress the logic of the foregoing on any unprejudiced reader.

Three-year Apprenticeship.		Six-year Apprenticeship
52	weeks in a year	52
$ 8 00	wages per week	$ 6 00
$416 00	" " year	$312 00
3	years apprenticeship	6
$1248 00	total wages	$1872 00

Seven years Journeyship.		Four years Journeyship.
52	weeks in a year	52
$12 00	one week's wages	$18 00
$624 00	one year's wages	$936 00
7	journeyman years	4
$4368 00	" wages	$3744 00
1248 00	apprenticeship "	1872 00
$5616 00	ten years' wages	$5616 00

Thirty years journeyship

$3 00 per day	$28080 00
2 00 "	18720 00
Bonus for skill and ability	$ 9360 00

It can thus be readily seen how dearly some pay for the "big head" privileges they think so much of while serving an apprenticeship lasting all the way from three months to three years, as we see done these days. Here we have as good as $10,000 actually thrown away, a young fortune, because self-denial is not practiced. Parents are greatly to blame for this, and prefer to, in a measure, injure if not ruin the lives of their sons and prevent their entering on a prosperour career, all for the sake of securing a few extra cents in early life.

The adoption of this policy not only prevents them from being placed in a position where they could command steady employment at first-class wages, but also limits their opportunities to rise to something better than an employee's position, and in addition sends them into the world as poor mechanics who will more than likely be about half their time of employment looking for work and the other half, objects of censure and rebuke.

How much better it would be to have this given them when young and but boys. It is the schooling time of life when advice and admonition are to be expected. If a reprimand is administered then it is with a view of stimulating an effort to do better, and it is certainly more advisable that they should be given during boyhood than manhood. Volumes might be written on this subject, but enough has been given here to furnish food for thought to anyone deeply interested in a problem that means much to our trade.

The "old school" will pay the employer as well as the employee, and if beginners who perchance may read this, will keep that $10,000 before their minds' eye, it may be the means of doing some good.

Cast Iron Tanks.

TO THE EDITOR:

In your January issue I see an inquiry from foreman of bench foundry in regard to making tank castings. If he will kindly give sketch of 10 gallon tank he may learn of something of interest to him in castings, as there are many kind of tanks now in use made of cast iron, and the deficiency in casting depends upon the shape of tank and the correct way it needs to be cast. It may have to be run with a flat gate or the iron to be run up instead of down, as much depends upon the manner of gating. He says he is a bench molder. May I ask if he is trying to make a 10 gallon tank on the bench? the kind of tank may have something to do with the molding but nothing to do with running the casting. The iron may be objectionable, as some irons are very sluggish and would not run a light casting. The greatest difficulty or trouble is with the molder, as in my experience it takes a first class No. 1 molder to make a tank casting of that size, and the utmost care should be taken in preparing sand for same, and ramming mold as sand or ramming too hard will produce imperfect castings.

MOLDER.

The Deposit Iron Company, of Deposit, N. Y., and not of Hancock, N. Y., as mentioned in a recent issue, expects to have their newly enlarged foundry and new furnaces going by April 1st. Malleable castings are their specialty.

Your magazine, as it strikes me, is a wonderful success, fully equal to anything Yankee enterprise has so far shown. R. D. MOORE,

Foreman I. R. E. Greenwald Co., Cincinnati, O.

DANIEL F. TREACY.

THAT the making of castings for use in pianos gives employment to a large number of men is not, we believe, generally known, but it seems there is one if not more firms doing business in this country who devote themselves entirely to this branch of the business.

DANIEL F. TREACY

Prominent, if not indeed at the head of this list, stands the well known firm of Davenport & Treacy, of Stamford, Conn. The subject of this sketch, Mr. Daniel F. Treacy, who has charge of the works and oversees the manufacturing end of the company's business besides giving more or less attention to its outside interests, being a practical molder and foundryman, as well as capable business man.

He commenced life's journey in the British Province of New Brunswick, and in his youth was apprenticed to the molding trade in Chatam, N. B. Three months after the expiration of his term of apprenticeship, Mr. Treacy's family removed to St. Louis, Mo., where the subject of this sketch was employed for some time in the Carondelet Iron Works. Leaving here he worked in various shops in a great many different cities, acquiring not only an extensive experience and large fund of general informa-

tion, but a roving disposition also, and it was while working in the old whaling town of New Bedford, Mass,, that the seafaring instinct of early boyhood days induced him to ship on a whaling vessel bound on a three years course. Before this term was completed, however, the vessel was disabled and compelled to return for repairs. Mr. Treacy, however, was not in need of repairs and immediately shipped for another ocean voyage which came near being his last, as the ship was wrecked and the crew cast awaw on one of the West India Islands, from which accident Mr. Treacy emerged safely however.

In 1870 he was back at his old business and held the position of foreman at the Acushnet Iron Foundry, New Bedford, Mass. He subsequently removed to Brooklyn, N. Y., going into business for himself, but gave this up shortly afterwards. In 1873 he met his present partner, Mr. Davenport, who operated a foundry in Jersey City, and after a brief conversation made an engagement with him as superintendent of his foundry interests, subsequently joining him as a partner, when the firm of Davenport & Treacy came into existence.

As an indication of the success attending their enterprising management it is only necessary to mention the fact that in 1884 they turned out as finished castings 275 plates which were drilled and finished in their own shop, while in 1889 they turned out the enormous quantity of 16,000 all ready for use and a corresponding large output of piano hardware. In 1887 they erected a modern plant in Stamford, Conn., as they had outgrown their Jersey City quarters and have there a well equipped establishment equal to the requirements of their rapidly developing business. They also do an extensive trade in composition, metals, of brass, copper and phosphor bronze and as an instance of their success in that line it might be mentioned that in 1889 alone they made two hundred thousand pounds of composition castings for the national cruisers then in course of construction.

Personally, Mr. Treacy is very popular with all his business acquaintances and associates and possessed of an easy, approachable manner that perhaps has much to do with his success as a business man.

If there is one thing more than another that he takes pride in it is the fact that he is a practical foundryman and but few men take as much interest in the business or have a more accurate appreciation of its possibilities and usefulness. The man or set of men that would undertake in his presence to belittle it or those interested or engaged in it would have reason to regret that they had not chosen some other subject of conversation.

Obituary.

William S. Moore, an extensive foundryman, machinist and engineer, of Alexandria, Va., died unexpectedly March 24, aged 72.

Thos. Goddard, head of the brass foundry firm of Thos. Goddard & Son, died at his home, 70 Grand street, New York, March 8. He was 67 years old.

Samuel L. Moore, the well-known foundryman and shipbuilder, at Elizabethport, N. J., died at his home there March 18, aged 91 years. He built a small foundry in Elizabethport 40 years ago, and the present large plant is the outcome of that effort combined with the deceased gentleman's energy and business capacity.

Oscar Barnett, the well-known Newark (N.J.) founder and manufacturer of brass foundry equipments, died suddenly at his home in that city, March 5, of fatty degeneration of the heart. His father, the late Stephen D. Barnett, was the oldest iron founder in Newark. Oscar Barnett was born in Rahway, N. J., January 14, 1835. He leaves a widow, three sons and one daughter.

David Houston, one of New York's veteran foundrymen, died at his home in that city March 10, of pneumonia. He was born in Whippeny, N. J., in 1825 and when the California gold fever came on in 1849 he was one of the first to go in search of the precious metal. His venture was successful, and upon his return in 1854 he went into business, later becoming the senior member of the foundry firm of Houston & Tompkins, iron founders at 150th street and East River, and 127th street and Lenox avenue. In 1867, however, he retired from the foundry business and became a builder on a large scale in Harlem, retiring from active business about ten years ago.

THE FOUNDRY

A TECHNICAL JOURNAL DEVOTED TO FOUNDRY INTERESTS.

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IF YOU FAIL to receive your paper promptly, please notify us.

THE FOUNDRY is issued promptly on the tenth of each month, and will spare no endeavor to furnish valuable news and information to those interested professionally or incidentally in molding, melting, mixing of metals, foundry management, etc. Persons connected with any of these lines of industry will confer a favor upon the Editor of this Journal by sending him news from their section of the country pertaining to the foundry interests, particularly individual theories and experiences of practical value.

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A Stove Made In Three Hours.

AS showing the thorough systematization of stove manufacturers, it is asserted that a resident of Sharon, Pa., ordered a stove at a foundry there. The pig iron was melted and cast, the frame put together, polished, set up in the purchaser's house and a fire started in it in less than three hours from the time he gave the order.

We clip the above from a recent copy of the *Philadelphia Record*, and as the same item has appeared once or twice elsewhere, we presume that it has some foundation. It will now be in order for some enterprising American record breaker to mine the ore, make the coke, manufacture the pig iron, make the mold, melt the iron, cast, clean and finish the castings, nickel plate and polish the bright parts, fit the stove together, set it up and cook a Thanksgiving dinner in 2 hours and 59 minutes.

A Consolidation of Large Steel Interests.

AT various periods during the past year or two the mechanical world has heard rumors of an impending consolidation among the steel foundry interests, and while those interested have often laughed at the suggestion, yet it has come about, and the daily papers have recently contained some definite information on the subject. From these we gather that the Norristown Steel Company, of Norristown, Pa.; Standard Steel Casting Company, Chester, Pa.; Sharon Steel Casting Company, Sharon, Pa.; Solid Steel Casting Company, Alliance, O.; Syracuse Steel Foundry Company, and Pittsburgh Steel Casting Company have entered into an arrangement whereby they have consolidated their interests, "bunched their hits," so to speak, and will hereafter be conducted by one management.

It is not expected that this will raise the price of castings, but on the contrary enable the stockholders to get some profit out of a business that has recently been suffering considerably from the evils of excessive competition.

The Stove Manufacturers' Meeting.

THE twenty-third annual meeting of the National Association of Stove Manufacturers will convene at the Auditorium Hotel, Chicago, May 2, and the Stove Founders' National Defense Association will hold their sessions at the same time and place. A number of interesting and valuable papers have been

arranged for and they will be presented before the manufacturers' meeting, among them being:

The principles of design as applied to the ornamentation of cast iron, with especial reference to stoves.

Pattern construction, including follow boarding.

Foundry management.

The relations between employer and employed.

The stove business on the European continent.

The education and production of efficient workmen.

Cleaning castings.

Can profit-sharing with employees be used to advantage by stove manufacturers?

The advantages or disadvantages of interchange of information and experience between stove manufacturers.

It is believed that these papers will contain valuable information and that the comments following them will be most instructive. Other papers are requested. Indeed, contributions upon any of the various operations of a stove foundry will be welcome.

The May issue of THE FOUNDRY will contain a full report of the proceedings of this gathering, and will be an especially interesting number.

Needs Watching.

THIS paper aims to be the friend of all honest, fair and legitimate enterprises, believing they should meet with every encouragement and protection, and as we have on previous occasions asserted, it is equally as firm in thinking that questionable or dishonorable methods should receive the condemnation and contempt of all good citizens. Our space has been occupied on several occasions, both in its editorial columns and by correspondents, in the effort to show up a class of men, who by every disreputable means in their power manage to keep the whole business world in a state of unrest and destroy public confidence in worthy institutions.

We refer now more particularly to the commercial anarchists in the foundry world, who find themselves unable, through lack of business ability or good management, to secure business in the ordinary way, and in a misguided moment inaugurate an era of ruinous competition, which immediately lands them in the hands of an assignee or receiver, with little or nothing left to pay a large number of confiding business men, who have relied upon false statements and solemn promises while extending a line of credit that only an honest man should receive instead of some precious rascal.

We have in mind a case occurring recently in this city in which the Allen Foundry Company failed after a brief meteoric career in which they cut prices to an extent that meant ruin to any but some wealthy institutions that could play the game of freeze-out to the end.

Not content with this, they insisted upon their employees working for less than was paid by all other establishments, and as a result a long and tedious strike was inaugurated, one reason being, as these same employees stated, to protect the wages of every other molder in the city. At length when unable to longer turn out good work, owing to the lack of competent help and finding foundry supply, coke and pig iron men tired of donating raw material to the use of this enterprising concern, they simply closed their doors and made an assignment, although Allen, its manager, was said to have only a few days previously held up both hands and called on his Maker to witness the statement that all debts would be paid in full, although even then concluding the arrangements for selling out the firm's equity in everything and calling in the assignee, thus causing the creditors to lose nearly all.

And now comes the sequel. Allen secures a position as manager of the Standard Foundry, in Cleveland, O., and after repeated reductions in wages, the men strike for the reason, as shown by the two principal papers in that city, that many of the molders received less than $6 a week, and it was a rare thing to find one getting $7.

Other proprietors in Cleveland have been complaining that they could not compete with the Standard's prices and would have to pay the same rate of wages, etc., and although willing to pay enough to keep body and soul together, there was no alternative left.

Such men are, we are thankful to say, very rare, and it is well for the commercial community it is so, otherwise the whole business world would be so badly disorganized and that confidence, so necessary between business men, so impossible that universal and never-ending panics would result.

It must have been the contemplation of some such character that inspired the poet to speak of the grave receiving its charge "Unwept, Unhonored and Unsung."

The Scrap Heap.

The reading portion of the world have recently been somewhat amused and interested with the published report of the adventures of Prof. Garner, who spent some months in Central Africa studying the habits of certain species of the monkey family, learning their methods of communication, or, in other words, their "language."

* * *

The professor, who built a hut or cage in the thickest part of the forest and spent a year therein, reports that not only have they a language all their own, but that they are in the habit of occasionally meeting in conventions or assemblages and discussing the issues of the day, as far as they relate to monkeydom.

* * *

Of course, some rash, uncultivated people may scoff at this and make all sorts of fun and ridicule of the learned professor, but in the opinion of THE FOUNDRY there is much to be said on the other side of the question, and considerable evidence can be produced to show the probability of its being as this scientific student of the animal kingdom declares he has found it.

* * *

To those who are so fortunate as to reside in America is vouchsafed the opportunity of witnessing an exhibition that ought to satisfy any reasonable human being that the monkey family is either not confined entirely to Africa, but can probably talk and perhaps even swear in a way peculiar to themselves. The sixty millions of long-suffering and patient inhabitants of Uncle Sam's dominions have been for over half a year, spectators of an exhibition that is being carried on at this nation's Capitol by those chosen to represent them, that is fully as ludicrous as the published statements sent out by the African explorer concerning the customs and "doings" of the monkey family.

* * *

This country for about a year has been suffering from a panic, "cause unknown," as the coroner's jury says, that has caused a shrinkage in business of over 60 per cent., closed up our manufacturing institutions by the thousands and brought untold suffering to millions —yes, millions of people. The President of the United States sought to mitigate some of these evils by calling a special session of Congress to repeal a silver bill that was thought to be the potent agency in bringing about all this trouble. Congress met, several bills were presented and put through all the multitudinous ramifications that these law makers have devised to prevent the rapid transaction of business that pertains to the public welfare (private bills generally slip through easily), and at length, after months of talk, parliamentary debate, adoption of rules, rejection of amendments, motions to adjourn, points of order between political opponents and all sorts of obstructional methods, the bill, which might have been of some possible use if attended to promptly, as one business man would transact business with another, is permitted to go through and received the President's signature, becoming law, the only noticeable "good" being a little more contraction of values and hardship in mining States.

* * *

Next we have a tariff that must be hauled to pieces, patched up, yanked hither and thither in such a way that those at all interested in it from a financial standpoint are uncertain as to the result, and after more wrangling that would disgrace any monkey show on earth, it is finally passed through one branch of our National (mis)government and goes to the next where, by a frantic effort on the part of nearly every one present to have it passed in accordance with each individual whim, it is likely to stay for two months more. In the meantime the country and every man, woman and child in it still suffers.

* * *

Of what avail is it to those gentlemen in Washington that millions of eyes are cast appealingly toward them? They are busy scoring points against their political opponents, making their presiding officers earn their salaries, deciding knotty parliamentary problems.

* * *

It is of far more importance to them that some man who belongs to the dominant party shall be seated instead of one who does not, or that some particular ruling of a previous presiding officer should be sustained, than that legislation should be enacted on the p. d. q. plan to give our languishing business industries a show for their lives.

* * *

These gentlemen are busy "playing to the galleries," but it is not what they are there for and the people of this country are getting ready to follow that leader or set of leaders who will favor giving business matters rapid

transit, believing that the doubt and uncertainty resulting fro a these long-drawn-out conflicts is more disastrous than any evil that would likely arise from measures passed too hastily.

* * *

The whole spectacle is about as bewildering and not near as funny as a three-ringed circus. We have the President, Senate and House of Representatives, each engaged in running in a measure their own show irrespective of the others, and just what the outcome is likely to be no man can foretell.

* * *

General Coxey may be all that people generally think he is, but it is a question if something is not needed to induce these people to get to work and help us. Thousands of relief committees have been busy for months and have not accomplished a hundredth part as much as could be done if we had that tariff question quickly settled.

* * *

The curse of this country just now is "politics," we have too many politicians and too few statesmen.

The Shaw Electric Traveling Crane.

FEW improvements in machine shops and foundry appliances have so rapidly revolutionized former practice as the application of electricity to the operation of traveling cranes.

Five or six years since, very few traveling cranes were used in foundries, the jib crane having the field almost entirely to itself. The jib crane was preferred because its movements were thought to be easier, smoother and under better control, than those of the traveler. This belief was undoubtedly well founded, for the power traveling crane of that day was slow in its movements, usually started off with a jerk and a shiver, and had but a small range of speeds. More than two speeds were seldom available, and many travelers had but one. This, if slow enough to be used for drawing patterns or coping off, was so long "getting anywhere" when used for "cleaning up" that it was in many cases cheaper to do all the work possible by hand labor. If the crane was fast enough to be of much use for cleaning up, it was not adapted to the more delicate work. Even with two speeds the case was not much better, as the slower speed was too fast for the more difficult work on the molding floor, while, on account of the suddenness with which the movements would start up when the clutches "took hold," the higher speed could not be made as fast as would otherwise have been practicable.

On account of this jerkiness of action, "drops" and breaking down of molds were not infrequent. On some cranes very skilled operators could get fairly satisfactory results, but to do so required great care and frequent and accurate adjustment of the clutches.

If so adjusted as to handle easily and not "pick up" too suddenly with light loads, the clutches would slip when doing heavy work, so that many expert operators were in the habit of resetting their clutches for every considerable change of load. This was inconvenient, and when the crane was in constant use, caused much lost time.

These cranes were complicated, seldom having less than fifty or sixty gears and eight clutches, even when only two speeds were available. Three or four-speed cranes would have seventy or more gears and ten clutches. In addition, there were from one to eight or ten square shafts with sliding gears, and numerous tumbling bearings which must be gotten out of the way of the trolley and replaced again after it had passed.

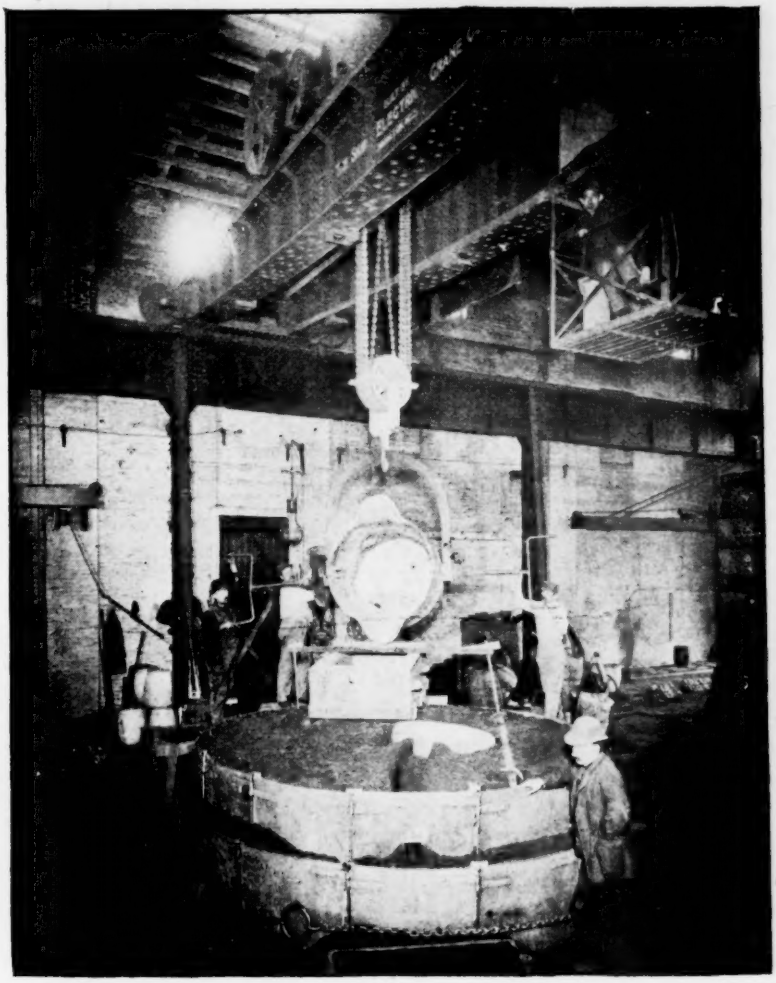
It was on account of all of these disadvantages of the "power" traveling crane that most foundrymen preferred steam or power jib cranes despite their disadvantages of covering a limited floor and wasting a too large part of that, and the inconvenience of transferring from one crane to another in moving work any considerable distance. When heavy cranes were used, the strains on the building were very severe, and very heavy and expensive constructions were necessary to withstand them.

All these troubles were done away with and the traveling crane made almost the ideal machine for doing all the lifting and handling of the foundry by the application of an independent, reversing, electric motor to each movement, thus not only eliminating all clutches, square shafts, sliding gears, tumbling bearings and disengagements of every kind, but at the same time enormously simplifying the mechanism and increasing the range of speeds readily available and under perfect control.

The slowest speed could be made so slow that the fact that the crane was moving at all could be determined only by sighting across the load to some fixed object, or noting the movement of the chains as they crawled around

the sheaves, and the speed could be gradually accelerated without shock or jar until the rate of movement was much higher than had ever been attempted on the older types of cranes. These changes of speed were attained, not by throwing in first one clutch and then another, as on "power" cranes, but by increasing or decreasing the pressure of the current supplied to the motors, and this could be done as gradually and as smoothly as the pressure of steam supplied to an engine could be varied by spring or closing the throttle valve. In addition to this, the speeds of the hoisting and lowering, racking, and traversing movements, were each varied without reference to, and independently of the others, thus rendering the crane more flexible in its application and greatly increasing the speed with which work could be handled.

The first crane operated by independent electric motors, one for each movement, built by the Edw. P. Allis Co., of Milwaukee, from the designs of Mr. A. J. Shaw, then employed by them as a mechanical engineer, and put into service in their foundry in 1889. Although



of but twenty tons nominal capacity it has frequently handled loads exceeding thirty tons. It has been in constant use ever since its installation, running much of the time from 16 to 20 hours per day, and although the "first" machine, and consequently largely experimental, has cost almost nothing for repairs. Al-

though the delicacy with which work could be handled with this machine, seemed, to those accustomed to the harsh and irregular movements of the mechanically driven crane which it replaced, almost marvelous, the inventor has improved upon it in this respect, as in many others, until his latest cranes leave little to be desired either in simplicity, smoothness of movement, accuracy of control, range of speed or reliability in service.

The handling of these cranes involves no difficult or delicate manipulation or adjustments, but only the movements of hand levers, one each for hoisting or lowering, racking, and traversing, a greater or less distance either way from their central positions. When a lever is central, the current is cut off from the motor controlled by that lever and it is consequently at rest. Throwing a lever either way starts its motor in a corresponding direction at a rate of speed dependent upon and approximately proportionate to, the distance through which the lever is moved. The starting may be made as gradual as desired by throwing the lever over slowly and the speed will stop increasing when the movement of the lever ceases.

An absolute safeguard against "racing" in the lowering or the dropping of the load in case of failure of current from any cause, is provided in the "automatic duplex brake," which is a combination of two brakes, one applied automatically by the reaction of the load itself which slides down only as fast as the brake is released by the motor; the other held "on" by a powerful spring except when released by a magnet energized by the current flowing to the hoisting motor. If this current be interrupted, either intentionally or accidentally, the magnet becomes inoperative, the spring instantly applies the brake and stops the motor and the entire train of gearing connected therewith.

With electric cranes having only the magnetic brake, the usual construction, the control of the operator over the load in lowering is very imperfect; as, when the magnetic brake is released by the actuating current, there is nothing to prevent "racing," for both the load and motor are pulling in the same direction with nothing to restrain them; but when the mechanical brake is added no "racing" can occur, as the load is sustained independently of either the magnetic brake or the motor, and can descend only as the latter "pulls it down."

The superiority of these cranes for foundry use over those of any other type, especially for heavy work, is best evidenced by the rapidity with which they are replacing all other kinds. In the Allis foundry already referred to, the Shaw Electric Crane Company now have three electric travelers, replacing two "power" travelers, and three power jib cranes. Besides having supplied many iron foundries, they have placed their cranes in four steel casting plants and one brass foundry. This last application which, on account of the unusual weight of the work done, may be of some interest, was at the works of Wm. Cramp & Sons, Philadelphia, and is shown in the accompanying cut. This was made from a photograph taken shortly after pouring a manganese bronze propeller blade for the steamship City of Paris. This casting weighed 14,000 pounds, and 17,000 pounds of metal were used to pour it.

This crane is of twenty tons capacity. Some idea of the very heavy work which this foundry is doing may be had from the weight of the molds, some of which have run fully up to the nominal capacity of the crane.

This crane was sold Wm. Cramp & Sons, by Manning, Maxwell & Moore, 111 Liberty street, New York, and 60 South Canal street, Chicago, the sole sales agents for the Shaw Electric Crane Co.

Our Chicago Letter.

(*Special to* THE FOUNDRY.)

FOUNDRY business in Chicago has taken another slump. The month of March started in with an improvement and all were of the opinion that business was going to revive, but for some reason the bottom has dropped out and things are again at a standstill. The probable cause is the inaction of Congress. What the people want is action on the tariff and other important questions, and not talk all summer. Senatorial courtesy may be all right, but the majority of people no longer think so. To use an old saying, these is a time when "forbearance ceases to be a virtue," and if this saying was ever applicable it is now. The idea of electing and re-electing men to the United States Senate with the belief that the country will go to ruin unless they are there, is a mistake. This government has run since the founders of it have died, and it will run after its present officers are gone. That we owe a duty to the men that have done so much for the country sounds patriotic and is all right, but while we owe a duty to these men, they, in return owe a duty to the people, viz.: that of remaining out of public office if they are not

physically able to attend to their duties. Electing men to public office who ought to be in the hospital is a mistake. Men of 70 years and over are too old to go to the United States Senate. Although they may be all right mentally, the infirmities which usually attend persons of that age incapacitate them for public duty. A man accepting a seat in the United States Senate at 65 years will be 71 at the expiration of his term, at which age he should retire and give a chance to younger men, of which there are plenty equally as smart and capable of filling the place. The prediction in last month's letter, that Chicago foundries would not escape the labor troubles, has been fulfilled. The strike at Crane Company's is still on and no prospect of a settlement. Following is the method of settlement proposed by the strikers and rejected by the Crane Company:

"First—That the company withdraw and suspend the last reduction of wages, pending a peaceable and just settlement of the matter.

"Second—That from the judges of our local courts a board of arbitration be jointly selected, before whom, either secretly or publicly, at the option of the company, the affairs of the company shall be shown, and if such exhibit shall in the judgment of the arbitrators sustain the company's reduction of wages, then we, the employees, will accept such reduction as an unavoidable and deplorable necessity.

"Further resolved, That upon the indorsement of this statement and propositions, our committee be and are hereby instructed to present a copy thereof at once to the officers of the company, and pending the answer of the company, everything possible shall be done to strengthen our position and prevent both violence of speech and action."

The David Bradley Mfg. Co., engaged in the extensive manufacture of agricultural implements, is seriously contemplating the removal of its works to some suburb of Chicago. They now occupy about 700 feet of frontage on Jefferson, Desplaines and Fulton streets, which will be placed on the market if the company decides to move. Two sites have been under consideration, one at Waukegan and the other at Chicago Heights, though it is believed that the latter place will finally be selected.

The Chicago Architectural Iron Works, Oakley avenue and Kinzie street, of which State Senator M. Salomon, the well-known attorney is president, are working full force, employing about 250 men. They are just completing one of the finest and largest ornamental iron store fronts ever erected in the West, viz.: the Garfield Building for the Cleveland Syndicate Co., Cleveland, O., of which Henry Ives Cobb is the architect. The front is 40 feet high, embracing two stories, and 350 feet long, weighing over 200 tons. They are also finishing up the interior iron work for the United States Post Office and Court House, Duluth, Minn.; the United States Post Office and Court House, Paris, Tex.; Cook County Criminal Court Building and various other large structures. The energy and push displayed by the above firm is commendable.

Pittsburg and Vicinity.

The Trade Outlook.

(*Special to* THE FOUNDRY.)

THE reports during the past month do not show anything of an encouraging nature. Manufacturers are only filling orders as they are received, but in some places extra exertions are being made to secure work. The market continues dull, although there was a slight movement in foundry irons about the end of March.

In some lines of the market the outlook for the coming summer is considered good, and it is thought by some that with the Wilson bill removed, trade would take quite a spurt. Occasionally a concern reports that its business is equal to what it was this time last year, but on the whole the depression has lifted but little. Prices of foundry irons show no change since our last report and may be quoted as follows:

No. 1	Foundry,	$11.25@11.50	cash.
2	"	10.50@10.75	"
1	Charcoal F'ndry,	17.50@18.00	"
2	" "	17.00@17.50	"

The Totten & Hogg Iron and Steel Foundry Co. has contracted with the Emlyn Iron, Steel and Tin Plate Co., of Summitville, Ind., to erect a complete tin plate plant, consisting of two 24" hot rolling mills, three 20" cold rolling mills, a 600 h. p. Ætna engine with counter shaft and gear wheels, four large steel tubular boilers, 150 h. p. engines, two doubling shears, one trimming shear and additional rolls for the hot and cold rolling mills.

McVay & Walker, founders of Braddock, Pa., have received the contract to do all the cast iron and wrought iron work at the new plant of the Westinghouse Electric and Mfg. Co., at Brinton. The contract calls for about 400 tons.

Sterritt & Thomas still continue to operate their plant on a number of orders. They report business as still being rather backward.

The Fischer Foundry and Machine Co., of the South Side, is operating its plant on repair work only. About one-seventh of the entire force of workmen find employment.

The A. Garrison Foundry Co. reports that there is very little demand for rolls, castings, etc., and that at present only about 175 men are employed at the plant.

The Reliance Steel Casting Co., Ltd., has its plant running with a reduced force of workmen on single time. A slight improvement in business is felt by this company.

The Robinson Rea Mfg. Co., of this city, has placed an electric planer in its plant, which is 27 feet long and cuts at the rate of 13 feet per minute. This machine was purchased from Wm. Sellers & Co., of Philadelphia, who had it constructed expressly for exhibition at the World's Fair, but which occupied too much space.

The Leechburg Foundry and Machine Co. has the contract which calls for the changing of two steel mills into tin plate mills for the Ætna Standard Iron and Steel Co., of Bridgeport, O. The order includes a new outfit of rolls, shears, engines, two cold rolling mills, one Mesta patent pickling machine with vats, crates, etc. The same company has also contracted with the United States Iron and Tin Plate Mfg. Co., of Demmler, for one Mesta patent pickling machine, making the second one now in use at this company's plant.

Stove Molders' Scale Settled.

THE stove molders' scale has been satisfactorily settled and the men have had their "strawboards" changed so as to work on all forms of stoves.

This scale settlement means the continued operation of 19 stove foundries employing nearly 800 men, besides a number of unskilled men who are given employment. The last strike in this line of trade work occurred in 1886-7, when the Stove Manufacturers' Association sought to reduce wages, which act was bitterly opposed by the molders, but who succumbed after a fight which lasted several months. Since then peace has reigned in this line of work and all works have been in fairly good operation.

The Latest Consolidation.

THE welding together for some time past, of some of the steel casting concerns of the country, has at last been accomplished, and the trust or combination is now known as the American Steel Casting Company. The property, rights, franchises, etc., of the following companies have been transferred to the American Steel Casting Company, whose main office will be located at Chester, Pa.: Norristown (Pa.) Steel Casting Co.; Solid Steel Casting Co., of Alliance, O.; Sharon (Pa.) Steel Casting Co.; Syracuse (N.Y.) Steel Casting Co.; Standard Steel Casting Co., of Chester, Pa., and the Pittsburg (Pa.) Steel Casting Co. There are two other companies in the same line of business, but they are not considered as competitors, as they also make iron castings and do structural work of all kinds, including the placing of machinery. The object of the American Steel Casting Company is to reduce the cost of producing steel castings. Methods of making steel castings are rapidly being improved and steel in this line is fast taking the place of iron. One manufacturer in speaking to a representative of THE FOUNDRY stated that he "did not know of a single plant in and around the district he represented that has any iron castings; that they are all steel. One large plate glass manufactory in Western Pennsylvania, which was fitted up with iron castings a few years ago, has not one now, but they are all made of steel. Low prices for steel castings are an absolute necessity, and it is more than probable that the rates will be further reduced. It is not the object of the consolidation to fix arbitrary prices."

It is said that quite a saving will be made by the reduction in the number of offices, including traveling salesmen and other positions, as one establishment in Pittsburg claims there will be a saving of about $8,400 per annum, which includes the secretary and treasurer and two salesmen. While other firms employ from three to six salesmen, it can be readily seen that a large saving can be made. The steel casting trade of the country is but following the general industrial trade in gathering together all the forces and dropping off the many items of expense which cannot be avoided in the running of a single plant, but by the consolidation of a number under one name and under one management only.

New Foundry Enterprises.

The new foundry at Wolf City, Tex., is now in full blast.

Shaw, Kendell & Co. are erecting an addition to their foundry at Auburndale, O.

J. C. Earhart & Son are building a new foundry in Harrisburgh, Va.

Dunning & Clark will build a foundry at Donaldsonville, La.

Jno. Everhart is building a new foundry in Akron, O.

The Columbia Foundry and Machine Co., at St. Joseph, Mo., has been incorporated; capital, $50,000.

The Alexandria Iron Works is the name of a new corporation with a capital stock of $20,000, just organized in Alexandria, Ind. They will operate a foundry.

The radiator works and foundry of the Thatcher Furnace Co., at Argentine, Ks, were sold recently to Homer Smith, of Topeka, for $50,000. It is intended to incorporate a company with $100,000 capital and push the business.

The Anniston Pipe and Foundry Works, Anniston, Ala., will place another pit in operation at once and 75 additional men will be given employment.

Among the Foundries.

Patch & Swift, of Streator, Ill., have dissolved partnership. Mr. Patch will hereafter run the business alone.

Nathan C. Porter has purchased a one-half interest in Knapp's Foundry at Wolcott, N. Y.

Jno. L. Shanafelt has bought one-half interest in the Greentown (O.) Foundry.

W. F. B. Stewart has sold his interest in the Baugher, Kurtz & Stewart Co., at York, Pa., and a new firm has been organized to continue the business.

The city of Cleveland claims that there is a combine among water pipe manufacturers, and as a result the city is getting the worst of it. It has submitted as evidence of that fact in the legal controversy now pending, an affidavit to the effect that the Lake Shore Foundry, of Cleveland, which claims the contract for supplying that city with its pipe, has made a bid to supply water pipe from 4 to 10 inches to Orville, O., in small lots, at a much less figure than it would furnish pipe in large lots of a larger and heavier size right at home.

Euard & McDonald, stove founders at Montreal, have assigned.

James R. Carroll has bought out the interest of Alfred Butler in the Carroll & Butler Foundry, Hancock, Mich.

The Farrell Foundry and Machine Co., Ansonia, Conn., which cut the wages of its 700 employees last fall, has voluntarily restored 33⅓ per cent of the cut. Ours would be a better country were there more such concerns.

The report that the Smead Foundry Co., of Toledo, O., which collapsed some time ago and was reorganized, is again embarrassed and has closed its shops, is denied by the company.

The Alexandria (Ind.) Iron Works has been organized for the purpose of carrying on a general foundry business. Operations were begun April 1. The company consists of Lewis and J. D. Heffner, E. T. Warner and others.

The Bellevue Foundry, near Schenectady, N. Y., owned by Wm. B. Turner, was put in operation on April 15, with a large force of men. A number of good-sized orders have already been booked.

John H. Bass, of Indianapolis, Ind., has recently completed the erection of a car-wheel plant at Lenoir City, Tenn., which will be used for the manufacture of cast iron car wheels for the southern railroad trade. As yet the foundry is not in operation, as the necessary machinery has not been placed.

The Anniston (Ala.) Pipe and Foundry Co. states that it has received a dozen important orders at figures that will leave it a very fair margin of profit. The company is increasing its force daily and is receiving orders from various parts of the country. Another pit was put in operation a short time ago.

The Eureka (Cal.) *Standard* of March 5, has a lengthy description of the Eureka Foundry, the largest establishment of its kind in Northern California, and from which we learn that the iron foundry department alone in these immense works is 60'x60', equipped with two cupolas, 10-ton traveling cranes, etc.

The Salt Lake Co-operative Iron Works, of Salt Lake City, Utah, has been organized to do a general foundry, machine and manufacturing business. A foundry plant has been leased in that city, where it will be the aim of the company to supply that part of the country with castings, etc., which heretofore have been imported from eastern cities.

The National Car Wheel Co., of Buffalo, N. Y., will soon commence the erection of a foundry plant, which will be equipped with all modern appliances.

The Rankin & Fritsch Foundry and Machine Co., of St. Louis, Mo., has put its plant in full operation with a full force of men. A number of large sized orders has been received, which will keep the plant going for some time.

The United States Iron Works Co., of New York City, has purchased a foundry plant on the water front in Brooklyn, which will be fully equipped with tools for the manufacture of improved railroad frogs, switches, crossings and track tools.

Personal.

Wm. Forbes, for many years foreman of the foundry department in the Watts & Campbell Engine Works at Newark, N. J., has charge of the Thompson & Bushnell foundry at Jersey City, N. J.

W. M. Rhodes, of Whitehall, Minn., has purchased the foundry of the Price Mfg. Co., at Black River Falls, Minn.

The Fire Fiend.

A small foundry at Duryea, Pa., owned by Stephen Miller, of Wilkes-Barre, was destroyed by fire March 17. It was operated by Gatwell & McMurtrie, whose loss is $2,000.

Foundrymen's Association.

THE regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on the evening of Wednesday, April 4. President Schumann occupied the chair.

Secretary Evans read the report of the executive committee, which announced that the committee was well pleased with the condition of the association, and added that the recent discussions on matters of interest to foundrymen, in which the association had engaged, had been productive of much good.

Mr. Whitney, representing the car wheel section, reported prices about the same. Mr. Brown, of the committee on sash weights, reported prices very low. Mr. R. A. Register, of the soil pipe section, reported: "Still full, and prices a shade lower." Mr. Flagg, of the committe on small gray iron castings, noted "a trifle more business."

Mr. P. D. Wanner, representing the cast iron pipe section, said: "Prices were low in December, they became lower still in January, kept going down in February and March, and April brings little prospect of better things. We have been experiencing terrible times, for which we are ourselves in a great measure responsible. A great deal of animosity has been shown by Congress in the speeches against the manufacturers of the country. Members have said a great many things that are not true, and have displayed much venom. Now, if we would only stick together, instead of losing money and time, we might reverse the condition of things. We might say, 'We have been losing money, but now we are going to fix a time to stop.' That would bring about a crisis in ten days which would make or defeat the bill they are now trying to frame. A movement started here, I think, would have weight. We might give Congress until May 1 to settle this tariff question, and then let them shoulder the responsibility."

The treasurer reported a balance in the treasury of $282.38. Mr. Evans then announced that Mr. W. J. Keep, of Detroit, had presented another paper embodying his replies to the arguments of several chemists on the subject of foundry tests. This paper, Mr. Evans said, would be the last Mr. Keep would submit for some time to come. As it was very long it was merely read by title, and Mr. Evans suggested that its consideration be postponed until the next meeting. Through the kindness of the *Iron Trade Review*, he had been supplied with advance proofs of the paper in sufficient numbers to permit each member to take a copy home for perusal at his leisure.*

Mr. T. T. Morrell, formerly chemist of the Cambria Iron Co., read a paper upon open hearth furnaces.

He was followed by Mr. C. E. Buzby,

*Owing to the length of Mr. Keep's article it was thought unwise to devote as much space for it as its publication would require, and it has consequently been printed as a supplement to "The Foundry," and is mailed to our regular subscribers with this issue.

superintendent of the Riehle Testing Machine Co., who read the following paper on "Machine Tests":

"The great value of the testing machine, not only in the iron foundry, but in all classes of structural manufacture, is to be found in the substitution of real for theoretical values. In most formulæ used by engineers a value is assumed for the material in question, sometimes based on very vague data, and varying perhaps several thousand pounds from the weakest to the strongest. In this case an average is generally selected which will bring the result somewhere within reason. When this result is combined with a factor of safety, we are still in doubt as to whether the result involves an excessive or inadequate factor.

"Judging from the price at which some castings are now delivered, we might readily expect that the average calculation would be far in excess of the real strength and in fact involve a doubt as to whethether the product is mainly iron or cinder. How much better to deal with accurate figures, test the actual strength of castings from each heat, by using specimens of a reasonable size, and secure a known value for your product independent of hearsay and textbooks. The growth of this tendency toward accurate, positive results is very marked, particularly among the iron foundries.

"The transverse test, combining the load with the deflection, has generally been selected as the ordinary standard. There is no doubt, owing to the cheapness of the machine, and perhaps to the fact that cast iron is so much used for frame work and subjected to transverse strains, while the tensile strains are allotted if possible to rods and bolts. The tensile strength of a bar of one inch square of cross section being eight to ten times that of a one-inch square bar tested transversely one foot between supports, involves a machine of eight to ten times the cawacity and consequent increased expense, for which manufacturers working on close margins of profit hesitate to pay.

"The tensile tests are nevertheless valuable, and numbers of them are sent to our laboratory for test on our regular high capacity tensile machines. For this class of work the form of the specimen becomes a matter of vital importance, as it becomes almost impossible to avoid a combined transverse strain, owing to the irregularity in the outline of the specimen.

"The form of specimen which accomplishes this purpose is of circular section throughout, has about three inches straight in the centre of say 1¼ inches diameter, or 1 square inch area tapering outwardly toward the ends, the largest diameter being reached about 1¼ inches from the end, from which point it is slightly reduced, the largest diameter being say 1⅝ inches, or in ratio of at least 2 to 1 as compared with the centre. The outline of the specimen at the largest diameter is a curve of large radius, so that the first bite of the grip is at a tangent point which insures its being pulled into the direct line of stress, and as the stress increases, the length of hold gradually increases until sufficient to break the specimen. When these specimens are made in a properly matched flask we have always found them satisfactory in results. The large diameter should not be too near the end, or the curve radius too small, or the end will crush off before the center pulls apart.

"A square bar is invariably curved more or less, and irregularities along the sides or edges are apt to give cross strains which reduce the value of the material. In the transverse machine the bars are rectangular and may be 1 inch square, 2x1 inches, etc., and lengths os 1 foot, 2 feet, or 4 feet, according to specifications furnished by different departments. Ordinary comparative tests in the foundry are made to show, first, the actual strength of the iron made; second, whether the iron is keeping up to standard; and third, whether cheaper mixtures will give satisfactory results as to strength and flexibility if they are otherwise sufficiently soft and workable. Most founders know the effect of excess of different ingredients, and the testing machine is a valuable check in experimenting with mixtures varying their chemical properties."

At the conclusion of this paper Secre-

tary Evans invited discussion, and Mr. Flagg asked: "How do the tests on two reliable machines compare?" Mr. Buzby: "They ought to be identical."

Secretary Evans then announced that a question box had been started, that members wishing to ask questions and still remain "incog.," might do so. One of the questions he had been asked to present to the association was this: "How long can iron be held in the cupola after the blast is on?"

President Schumann: "I suppose that means when the blast is on and the fan breaks."

Mr. Glover: "On one occasion I had 45,000 pounds in the cupola when the fan broke. I drained out all I could, took out the breast, banked it up and put a cover on. We were wrecked in the afternoon, and the next morning at 7 o'clock, about fourteen hours later, we had started again. I have repeatedly kept my furnace open from an hour to an hour and a half, but we were then using hard coal and not coke."

Mr. Evans: "Another question from the question box is: 'Does foundry coke improve or is it impaired for cupola use if held under cover a year?'"

Mr. Glover: "I read that 300,000 tons are stored at one time at the Homestead works. That would seem to prove that at least it is not impaired by being stored for a time."

Mr. Evans: "Question three is: 'How would open hearth practice work for gray iron, and what effect would it have in improving low grades and slack?"

No one seemed to be able to answer this.

The Birmingham Iron Foundry had written propounding this question: "Are the crop ends of Bessemer steel rails as used in the mixture for casting rail rolls any better than tool steel scrap? If so, why?"

Justice Cox, Jr.: "Rail ends will not bring as much money in the scrap market."

Mr. James: "In the rail ends the manganese is much higher than in tool scrap, and that has a tendency to whiten the iron."

Mr. Evans announced that a paper by Mr. W. B. Johnson, which was to have been read at the present meeting, would be held over until next month. The meeting then adjourned.

Malleable Iron Castings.

The Process of Their Manufacture Explained, Including Annealing, Practical and Theoretical.

BY S. BOLLAND.

THE process of decarbonizing cast-iron, in order to produce malleability, has been known for over 150 years. It was described in 1722 by Reaumur, a distinguished French metallurgist and philosopher, and patents for its application to the production of malleable iron castings were granted to Samuel Lucas, of Sheffield, England, in 1804, and fifty years later to Brown & Lennox.

Lucas, in his specifications, describes it as a method of separating the impurities from crude or cast iron without fusing or melting it, and of rendering the same malleable and proper for several purposes for which forged or rolled iron is now used; and also by the same method, of improving articles manufactured of cast iron, and thereby rendering crude or cast iron applicable to a variety of new and useful purposes.

All this, as we now well know, was accomplished by simply casting such articles in any desired shape and afterwards making them malleable by extracting the carbon from them.

This new industry rapidly developed, as was natural, seeing that so many articles difficult of forging could be made with comparative ease this way, and thus reduce the cost of production immensely. Foundries specially devoted to the production of this line of work multiplied in all directions, and every effort was put forth to establish the business on a sure basis. Success attended these efforts to a marked degree, for the quality of the work done was so high as to almost defy the shrewdest to distinguish whether the products were malleable or only malleable cast iron.

The present extent of the business may in some measure be estimated from

the fact that in addition to the already large plants in this country, there is now in course of erection at West Troy, N. Y., a malleable iron foundry to cost $100,000. The main foundry is to be 75x427 feet, with three eils, each 75x375 feet, and in close proximity to the main building is the annealing room, a building 80x450 feet.

The castings produced by this method are sometimes called 'run steel,' and very large pieces, such as gear wheels, etc., are often cast and subsequently decarbonized. Screw propellers also are thus produced, in combination with 'case-hardening,' or conversion of the surface metal into steel by a subsequent process.

Hydraulic cylinders, which under ordinary circumstances would require to be cast six inches thick, are by this process made absolutely safe and watertight at about half the thickness.

A great variety of articles formerly made by the blacksmith are thus produced in a more economical and correct manner than could be by forging. Bridle bits, parts of blocks, snuffers, various forms of builders' and domestic hardware, some kinds of culinary and other vessels, and numerous other things are thus produced. Many of these are subsequently case-hardened and polished.

A certain amount of polish may be imparted to malleable cast iron without case-hardening, but the lustre is by no means so brilliant. It may also be turned in the lathe with about the same results as wrought iron, excepting that the tools suffer more under the operation.

The specific gravity of malleable cast iron is a trifle less than cast iron.

The softness and flexibility of this iron is remarkable, almost approaching wrought iron, yet it is almost impossible to weld it; but it may be joined together by fusion, or brazed to steel and wrought iron by the aid of hard solder. Another of its characteristics, peculiar to wrought iron or soft steel, is that thin pieces may be bent double when cold, but it is very seldom that the operation can be duplicated by bending it back again without fracture.

It would appear as if malleable cast iron was the intermediate state between gray iron and steel, possessing a higher tenacity, with increased toughness, than the former, but differing from the latter in having a lower ductility, less tenacity, and in containing graphite carbon.

Malleable cast iron, if plunged red-hot into water, is hardened, but the process of tempering cannot be reliably performed, as in steel. At a moderate red heat it is possible to forge some of the best qualities, but if it is overheated it crumbles away as soon as it is struck.

Owing to the non-removal of constituents other than carbon by this process, it is essential that a fairly pure cast iron be employed if it is desired to obtain a good malleable metal. English firms prefer the various brands of hematite, while in America the several brands of unquestionably good charcoal iron are selected from.

The mottled irons are invariably preferred for this purpose, for the simple reason that the soft gray iron, while it may be best for ordinary purposes, on account of its superior fluidity, is totally unfitted for this work, because its carbon, being wholly or almost in a graphite state, leaves the castings porous and weak after it has been abstracted from them by the process of decarbonization to which they are subjected. The white irons would be the best, having all their carbon in a state of chemical combination; but on account of the latter-mentioned condition, all such irons when melted are very sluggish and consequently unfit for pouring into the molds. This accounts for preference being given to the medium or mottled irons. These irons are sometimes further strengthened by the addition of steel or wrought scrap, the proportions of which alloys can only be determined by close observation and constant practice.

From the above general observations it will be seen that all soft gray irons are totally unfit for the production of malleable cast iron, and that a decided preference is given to mottled charcoal and all such irons as have been smelted from hematite cores.

Claude Wylie, in his instructive work, "Iron and Steel Founding," says: "A

short time ago we visited a foundry in England, where we were told they were making steel castings, and found the metal used to be old and burnt fire bars of which they had an unlimited supply. These fire bars were melted in an ordinary quick-melting cupola, the castings were made in ordinary green sand, and after the sand was removed from them they were passed into an annealing furnace with a large proportion of hematite ore, and there brought to near melting heat—in fact, some of the boxes we noticed had a portion of them melted off; in three days they were ready for use. The old fire bars remelted would be the most suitable metal for the purpose, containing no graphite carbon and little if any silicon. The castings we saw afterwards were all that could be desired as malleable cast; they bent and chipped like malleable iron, but could not be welded."

The molding of malleable iron castings need not differ in practice materially from that which is followed in the production of ordinary cast iron work, and it is usual to say that similar methods are followed. While this statement may be true partially, it is very evident that their practice is on the whole much superior to anything we see ordinarily in our best iron foundries. A most complete system of match plates, in conjunction with the almost faultless precision of the molding machines lately invented, conspire to make the molding of malleable iron castings a more accurate and reliable system than is dreamed of by those unacquainted with their methods.

Proprietors of iron foundries all over the country are becoming keenly alive to their own shortcomings in this particular, and are even now hastening to copy the methods so successfully inaugurated by their fellow craftsmen in the malleable shops.

On account of the lesser fluidity of the iron used for malleable iron castings, it is usual to cut larger running gates into the molds, but care is taken in selecting the best place for such gates, so that there will be no fracture caused should it be forcibly torn off by the extra contraction and brittleness of the iron used—a very common occurrence.

Very much of the common class of work is cast from an ordinary cupola after the regular manner, and not a little is melted in clay crucibles with a natural draft at the small places, but the reverberatory furnace is no doubt the most suitable means of supplying the right quality of metal for malleable iron castings. The iron, when melted in reverberatory furnaces, escapes immediate contact with the fuel and consequently does not absorb any of its impurities; and furthermore any excess of carbon in the iron charged will be considerably lessened by the oxidizing action of the flame during the process of melting.

For heavy crucible melting in England it is common to use a Siemens regenerative furnace, any degree of heat desirable being more certainly obtained at a much less cost for fuel than is possible by the old methods. The peculiar feature of this furnace is that the waste heat is employed to heat up both the gaseous fuel and the air requisite to burn it before they are introduced into the chamber in which they undergo combustion.

An explanation of the theory of malleable cast iron is given by Alder Wright, in Encyclopedæa Brittanica, who says: "In order to carry out the conversion of cast iron into malleable cast iron in this way, the articles to be treated are packed in cast or wrought iron chests in oxide powder; the chests are then stacked one above another in a kind of reverberatory furnace and gradually heated up to a red heat, which is maintained for the requisite time, after which they are annealed by slow cooling. With charcoal pig pretty free from silicon, sulphur and phosphorus and with fuel in the furnace free from any large quantity of sulphur, a soft, but tough, tenacious and readily malleable skin is produced. If, however, the heating is continued for some time after the whole of the carbon originally present has been removed, the articles become brittle, owing to the formation of the oxide of iron disseminated through the mass, just as copper, bronze and analogous substances are rendered brittle through a similar cause.

"This circumstance together with the known character of the chemical actions of carbon dioxide on iron and carbon at a red heat, indicates the nature of the processes taking place during the decarbonization. The ferric oxide and the heated air in contact with it first oxidizes the carbon in the outermost film to carbon dioxide; this then passes inward by the process of 'occlusion' (gradual solution of gases in solids), and reacts upon the carbon of the next layers, in accordance with the equation

$$CO_2+C=2CO,$$

the carbon dioxide thus formed first becoming dissolved in the iron, and subsequently, when the iron is saturated therewith, gradually diffusing outwards, becoming converted into carbon dioxide as soon as it comes in contact with either the ferric oxide of the packing or the partially oxidized iron of the outer film, which when free from carbon reacts on the carbon dioxide thus:

$$yCO_2+xFe=Fe_xO_y+yCO.$$

"In the outermost layers accordingly there is always a tendency to the formation of iron oxide in virtue of this reaction, and simultaneously a tendency to the reduction of this oxide by the agency of the carbon oxide which is being formed in the interior layers and traveling outward; as long as this latter action keeps the former in check, the accumulation of iron oxide in the outer layers does not take place to such an extent as to deteriorate materially the tenacity of the malleable iron skin, but when the carbon of the core has been so completely removed that the supply of carbon oxide from the interior almost ceases, the formation and accumulation of iron oxide in the outer layers goes on, rendering them more or less brittle. In the inner layers the removal of carbon by the penetration of the dissolved carbon dioxide, and its reaction on the carbon, is continually progressing, the decarbonization gradually creeping inwards, as it were, until finally the innermost central parts become decarbonized also. The non-removal of sulphur, silicon and phosphorus during the process is due simply to the fact that these elements are not acted upon by the occluded carbon dioxide as the carbon is, and consequently, not being oxidized, cannot be eliminated. The iron oxide used becomes partially reduced during the operation; in order to make it fit for use over again it is moistened with a solution of sal-ammoniac and exposed to the air in order to rust, and so re-oxidize it.

"The whole process is in effect an exact inversion of the chemical changes taking place during the manufacture of blister steel from malleable iron by the process of cementation, and differs from the ordinary puddling method for the purification of cast iron in this salient respect, that in the latter case the formation of oxide of iron by the effect of heated air, and its direct addition in the form of 'fettling,' give rise to the production of a fluxed mass, in which is incorporated a notably larger amount of oxide of iron which reacts on the carbon, sulphur, silicon and phosphorus, oxidizing them and converting them into products which are either gaseous and escape (carbon and sulphur dioxides), or are non-metallic and fusible, and hence separate from the iron as a fused slag or cinder."

Annealing or cementing furnaces are simply furnaces in which an article is packed in the powder of another substance, and therewith subjected to a continued heat below the fusing point. The article is changed by a chemical reaction with the powder.

Bar iron packed in charcoal and heated in a cementing furnace becomes steel, the iron absorbing some of the carbon from the charcoal.

Cast iron packed in powdered hematite or smithy scales and similarly heated, becomes malleable, the oxygen of the hematite or scales absorbing some of the carbon in the iron.

With some few slight modifications, the cementing furnace for producing blistered steel will answer the purpose of annealing or decarbonizing cast iron. Some of the late improvements in this country provide for the flame passing all around the chamber without coming into actual contact with the boxes containing the castings to be annealed. Access to this chamber is obtained at one

end, where the boxes can be inserted or withdrawn at any time without interfering with the continuous working of the furnace. The saving in fuel, as well as to the furnace, will be greatly appreciated, as it allows of almost uninterrupted working, the consequence of which is that the expenses for repairs incident to a periodic stoppage are avoided.

The Siemens regenerative gas furnace is much used in England for the annealing furnace as well as for melting with. As arranged for this purpose, the furnace has four longitudinal main flues divided by partitions into a number of smaller flues; the two exterior flues receive the heated gas, and the two interior ones the hot air. Over these is a closed arched muffle in which the annealing boxes are placed. The hot gas and the hot air being kindled, pass beneath at the sides and over the top of the arch of the muffle. The furnace is never permitted to cool entirely, the boxes being allowed to cool on the floor.

It is necessary that all castings, previous to being placed in the annealing boxes, should be freed from every particle of sand; this is done either by abrasion in the tumbling barrel, scrubbing with wire brushes, or pickling in dilute sulphuric acid. If the latter method is adopted, the castings should be thoroughly washed and dried before being placed in the annealing boxes.

The annealing boxes, sometimes called saggers, are usually made of cast iron, the same nature as the castings to be annealed therein. For ordinary purposes they are about 13 inches in depth and width and about 16 inches long, and if carefully used they will last from 15 to 20 heats. For heavier and larger pieces special boxes are made to suit the requirements, wrought iron sometimes being used for the purpose, but these latter warp and twist out of shape in a very short time.

The articles when cleaned are, in some places, imbedded within the annealing boxes in powdered iron oxide, viz., a pure red hematite ore, as free as possible from all earthy matter; at other places smithy and rolling mill scales or some analogous substance is used; they are then kept at a red heat in the annealing furnace for as long a time as required, when a diminution is produced in the amount of carbon contained, so that the cast iron becomes more or less converted into soft iron.

When the action is pushed to the extreme, all or almost all of the carbon is removed, that in the outer layers disappearing first. Should the heating not be continued long enough to remove all the carbon, that which remains is found in the innermost layers, which constitute a core of more or less decarbonized cast iron with an outer skin of malleable iron.

The powdered iron ore mentioned above is sometimes objectionable on account of the earthy matter which is sometimes mixed with it more or less; this latter when present in too great quantity is fused by the intense heat of the furnace, and adheres to the castings in the form of scoria. This not only interferes with the decarbonizing of the casting, but requires to be scrubbed off by a second hard application of the tumbling barrel or some other means equally efficacious.

On the other hand, the scales are entirely free from such impurities, and do not interfere with the legitimate operations of annealing. As before noticed, the scales lose some of their oxidizing properties at every heat, but that is effectively renewed by the application of dilute sal-ammoniac, and allowing them to rust again. By this means they can be used over and over again along with the new, which is added to make good the waste. When the ore is used it is previously ground and sifted; what passes through a $\frac{1}{8}$-inch sieve is rejected, as it contains too much earthy matter.

Packing the boxes is an important part of the annealing process. A quantity of the ore or scales is first placed on the bottom on which, separate from each other, the first layer of castings is placed. These are then covered to a depth of $\frac{3}{4}$ of an inch with the ore or scales, on which the second layer of castings is placed separate as before, and the operation continued until the box is nearly full, when the lid is carefully set in, resting on a final layer of the ore or scales; the covers are care-

fully luted, to prevent the admission of air. The boxes are usually inserted into the oven in pairs.

Long practice on the part of the furnaceman qualifies him for judging how long a time each casting requires for complete decarbonization; the heaviest are assigned to the hottest part of the furnace, marked in such a manner as will enable him to give to each class a period of heat proportionate to their bulk. For these reasons it is customary to place the castings in each box as near alike in bulk as possible.

The oxide which forms on the castings during the process of decarbonizing is a reliable indicator of the quality or degree of malleability obtained, the operator being able to judge of this according to the hues presented.

No matter how clean the scales may have been, all castings after being taken from the furnace require more or less cleaning to make them at all presentable.

The capacity of annealing furnaces varies somewhat, but they usually treat from 650 to 1200 pounds at one heat. The length of time required is from two days to two weeks, according to bulk; but, as explained at another place, they must not be kept at too high a temperature, nor remain too long, or the result will be opposite to what is desired—the castings will be hard instead of soft. Usually the heat is gradually slackened for about 15 hours before taking out the boxes, and the latter are allowed to become cold before taking out the castings.

Gobeille Pattern Company always aim to be original, and this fact of itself may have had much to do with their wonderful success as an institution where patterns of all kinds, sizes and styles are made. Formerly, every foundry having any work of any quantity at all to do would find enough for at least one pattern-maker. Now a days it is different and many large establishments, to say nothing of the smaller ones, have their patterns made for them by specialists in their particular line.

The above is prompted by the receipt of an original little advertisement in the way of a neat card enclosed in a semi-transparent envelope from the above mentioned concern, all containing direct references to their business.

Lessons in Patternmaking for Manual Training Schools.

BY P. S. DINGEY.

III.

BUSHINGS AND BEARINGS.

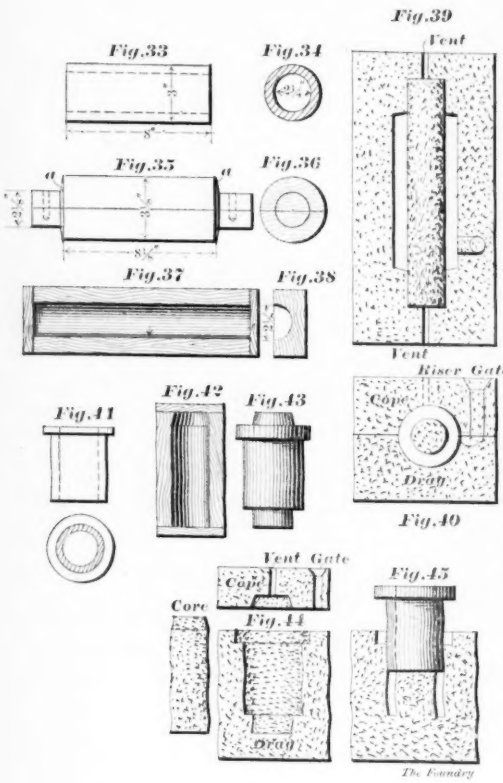
THERE is a very close relation between a bushing and a bearing; so close that both may be called bearings without making any serious mistake. Yet there is a difference that separates them one from the other and which makes a distinction necessary.

A bushing is more frequently made in one piece than otherwise, having a flange at one end and in some cases without any flange, while what is known as a bearing is usually made in halves with a flange at each end.

A plain bushing is shown in Figs. 33 and 34. Let the pattern for it be made to mold on the side by its being made in halves and doweled together, as Figs. 35 and 36. When preparing the halves for turning, screw them together with a screw at each end, and let the pieces be long enough so that the pattern with the core prints when turned will leave the screws outside—each end is turned a little slanting for draft, as shown at A in Fig. 35.

As bushings and bearings are generally made of brass, more shrinkage must be allowed when making the patterns than would be required for cast iron, because brass shrinks 3-16″ to a foot, while cast iron only shrinks 1-10″ or ⅛″ to a foot. Again, there is a difference in the amount of stock that should be allowed for finishing castings in the machine shop. Brass castings do not require as much as iron, on account of the scale not being so thick and rough as that on cast iron; therefore, they may be cast nearer to the finished sizes than cast iron. The amount of stock to be allowed for finish also varies with the size of

casting to be made. In the present case let the stock be 1-16″, as indicated by the dimensions of this bushing, being careful to use a rule graduated for brass shrinkage, or if using a standard rule, allow the necessary shrinkage.



Bushings

The core box from which the core is made, is shown in Figs. 37 and 38. It is customary to make and dry the core in halves, after which a small groove is cut lengthwise in each half on the joint, and the halves pasted together. The gas which the core generates when the metal is poured into the mold, passes out through this hole in the core, made by the grooves, commonly called a vent hole.

In order to give the student an idea as to the manner of molding this bushing, two views of the mold without the flasks are given in Figs. 39 and 40. The cope is away in Fig. 39, with core set in place. Fig. 40 is a cross section of the mold through the gate, with cope on, or "closed," as the molder would say.

Patterns for short bushings, such as shown in Fig. 41, are generally molded on end, and therefore do not need to be made in halves. They can be made either to form a green sand core in molding, or a dry sand core may be made in the same way as before.

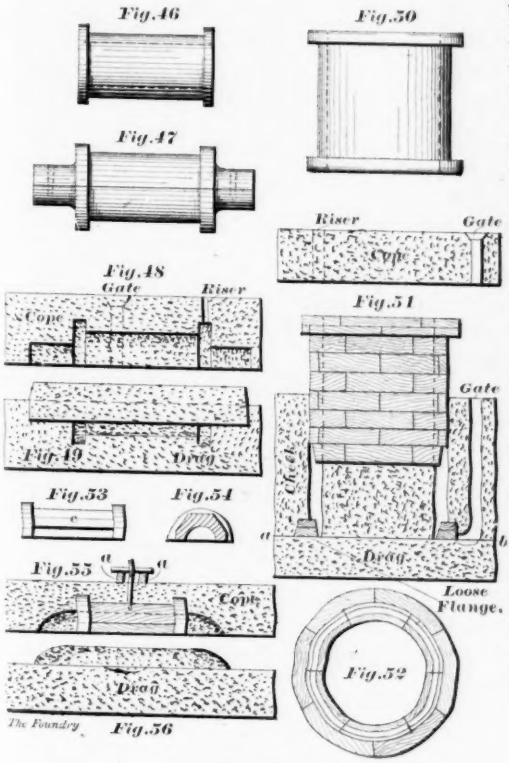
Fig. 43 is a pattern for the flanged bushing in Fig. 41, with cope and drag core prints; the core box is shown in Fig. 42. The mold in Fig. 44 with pattern drawn out, and the core alongside ready to be set in place, clearly shows the way in which this pattern is molded. Fig. 45 also shows a pattern for the same bushing, but made differently—the inside is turned out and the pattern is shown partly drawn, and forming a green sand core.

From Figs. 46 to 56 represent three bearings and the way in which the patterns are made and molded. Figs. 46, 50, 53 and 54 are the bearings; those in Figs. 46 and 50 are to be cast whole and cut in halves after the machinist has bored and turned them, but the half shown in Figs. 53 and 54 is molded and cast one at a time.

In comparing the pattern and mold in Figs. 47, 48 and 49 with those for the plain bushing in Figs. 35, 39 and 40, the student will see that in both instances the pattern and mold are made the same way. No explanation is therefore necessary except to call attention to the longitudinal section of the mold in Figs. 48 and 49, which is not given in the first case.

The pattern and a section of the mold for the large bearing in Fig. 50, are shown in Figs. 51 and 52, the latter being an end view of the pattern with loose flange off. This pattern being much larger than the one in Fig. 45, is built in courses, six segments in each course, while the smaller one was supposed to have been turned out of one piece, or two glued together, with the grain of wood running lengthwise of pattern. The pattern in Fig. 45 having but one flange, there was no trouble in drawing it out of the sand, but there being two flanges to this bearing, it is evident that if the both flauges were

built on to the pattern solid it could not be drawn out of the sand in the manner shown in Figs. 45 and 51. One of the flanges, therefore, is made separately to fit loosely on the end, so that after the pattern has been drawn, the loose flange will remain behind in the bottom of the mold to be drawn independently when middle part of the mold, called the "cheek," is lifted off. The joint, or parting of the cheek is at *a b*.



Bearings

In other three-part molds similar to *this one, instead of lifting off the cheek,* another way of getting at the loose piece of a pattern is resorted to. The mold is clamped together after the main part of the pattern is taken out and then turned upside down, or to use foundry language, "rolled over." When rolled over, the upper part is lifted off, allowing the loose part to be drawn out. When making this pattern to mold in the way shown in Fig 51, draft on the inside and outside must not be forgotten. The inner diameter on the lower end must be larger, say 1-32", than the upper, while on the outside the upper end must, in the same proportion, be the larger.

The pattern for small bearing in Figs. 53 and 54 is made by planing out a piece the same shape as that shown sectioned in Fig. 54, and the length of *c* in Fig. 53, after which the flanges are nailed on the ends. As will be seen, this pattern is molded differently to the others. The bottom part, or drag, and a section of the upper part, or cope, are shown in Figs. 55 and 56. The pattern is here represented as being brought up with the cope by having a spike driven down through the cope while the mold is closed, and into the pattern just enough to lift it. This spike is held in place by a small rod being passed through the eye and blocked up each side at *a a*. It is better to lift the pattern thus than to lift the cope away from the pattern, one advantage being that it prevents the mold from breaking away at the sides of flanges, which would likely happen if the cope was lifted away from the pattern. The question may arise, why not mold the pattern with flanges in the drag, and draw the pattern in the ordinary way? to which the answer is, because the bored part of the bearing, which must be perfect, would then be in *the cope and liable to catch the dirt and* impurities in the metal, which rise to *the top when pouring molds,* thereby running the risk of having a defective bearing surface.

FIRST HOBO MOLDER—Did you hit him for a job?

SECOND DITTO.—Yes.

FIRST DITTO.—What'd he say?

SECOND DITTO.—Said he was full.

FIRST DITTO. I wish I felt that way.

Mr. HENPECK (*soliloquizing*)—It is when I read of Solomon's many wives *that I begin to doubt the great wisdom* he is said to have had.

MISSIONARY—I have often wondered what became of my predecessor?

GENIAL CANNIBAL CHIEF—Oh, he! He has gone into the interior.

NOTICE.

Advertisements inserted under this head for 25 cents a line each insertion.

WANTED—A patternmaker and a machinist with $500 each, as partners in an iron foundry in St. Louis, Mo. Address J. M. McCash, 619 Harris avenue, St. Louis, Mo.

WANTED—A first-class foreman for jobbing foundry. Must thoroughly understand his business and know how to handle men to the best advantage. Address M. S., care "The Foundry."

WANTED—A good practical foundryman with some capital to invest in an established business as partner. Other partner engaged in boiler-making business that uses a great many castings. John T. this office.

FOR SALE.—Foundry, jobbing and repair shop; in a lively, growing city with a good country. Address, Wm. Engbring, Cedarburg, Wis.

Cincinnati and Vicinity.

(*Special to* THE FOUNDRY.)

THE anticipated revival of foundry business here, in my last letter, has come and gone, the few shops starting in full time with about a two-thirds force have returned to the three or four heats a week leaving matters in really a worse shape than before the spurt. The exceptions are the Jones Foundry Co., Chris Erhart Foundry and Machine Co., and Mowry Car Wheel Works, which are running full time and nearly full handed.

The Lane & Bodley Co., after successfully introducing a 25-per cent. reduction of employees, are trying the experiment of increasing the days' work also 25 per cent. on the principle that he who makes two blades of grass to grow where one before flourished, is a benefactor to his race. From a managerial point of view this is of course something of a very desirable nature.

The Laidlaw & Dunn Pump Co., capitalized at $500,000, are about to erect a large, modern plant for the manufacture of their specialties. In the Ivorydale vicinity, a suburb, they propose having a foundry. This company have recently combined with the old Cope & Maxwell Co., of Hamilton, O., and the business will hereafter be conducted by the above firm. The Queen City Foundry Co. are making their castings for them at present, and the high grade of mechanical ability employed by them are turning out the castings satisfactorily.

It is reported that the Addyston Pipe and Steel Co. are after a large eastern contract. In the event of their getting the same the boys have promised to hustle. They are building a large horizontal boring and facing mill of the same description as at the Newport works, probably the most convenient and useful tool that can be designed for the purpose. T. H. RADCLIFF.

New York and Vicinity.

(*From Our Own Correspondent.*)

THE foundry industry in this neighborhood remains in a very unsettled condition. During the past month an improvement was shown in some shops and a falling off in others, thus on the whole it can scarcely be said that the volume of business was greater than that done in the preceding month. The shops engaged in architectural work are an exception: the improvement in that line has been more general.

One sign that the foundries of this vicinity are established upon a good financial basis is the fact that no failures of any extent have occurred as yet. On the other hand, several firms have taken advantage of the slackness to improve their plants in anticipation of increased demands upon their capacity when trade revives. The wages of the employees in the different branches have been reduced generally to an extent that will place them beyond danger of being affected by the income tax, providing that measure becomes a law. The men at present show a disposition to harmonize with their employers in an effort to prevant work that should be done in the vicinity going to outside bidders whose plants are established in towns throughout the surrounding States where taxes and labor are much cheaper than here. This conclusion is reached after consideration of the sensible course pursued in not resorting to strikes to prevent the inevitable result of that depression in business that has been so much in evidence during the past nine months. Following are a few notes concerning foundries where enterprise is conspicuous at present:

Considerable improvement has been made recently in the light work department of R. Hoe & Co.'s foundry, Grand and Sheriff streets, this city. The fact had long been recognized by this firm that the structure in which the work of that department had been carried on was cramped and unsuitable in many ways for the purposes required. It was originally built for a tenement house, and when pressed into use as a foundry building it was no doubt only intended to be temporary. The improvements spoken of consist of an addition of 50′ in length extending toward Grand street, tearing down the upper story and raising the roof sufficient to make the building light and comfortable for foundry purposes. A track has also been laid to facilitate the carrying of metal from the cupola and removal of the castings to the cleaning room. A traveling crane for use in the department is also projected.

Messrs. Lalance & Grossjeans, manufacturers of agate ware, have leased the Puritan Iron Foundry on Water street, Brooklyn, formerly operated by Mrs. Elizabeth Mitchell, widow of the late James Mitchell. It is estimated that the firm's own work, consisting of presses, dies' etc., will be sufficient to keep the establishment in full blast.

Wm. M. Duffis, proprietor of the National Foundry, 43 Penn street, Brooklyn, is building a new foundry at the corner of Rutledge street and Kent avenue, just one block distant from the old stand. The dimensions are 100′x60′, equipment of modern type. It is expected to be in operation about the middle of May next.

The Bell & Fyfe Foundry Co., South Eleventh street and Kent avenue, Brooklyn, has added to its plant a new 20-ton crane with power attached. It is of the jib type and was furnished by Messrs. Weisbecker & Lattimer, millwrights and machinists, North Eleventh and Robeling streets, Brooklyn.

T. Schriver & Son, New York, jobbing brass and iron founders, manufacturers of electric traveling cranes, piano hardware. presses, dies, etc., have been running full blast for some time past. Extensive building improvements are in progress, but full particulars are not at hand at this writing.

John A. Radley & Co., architectural iron workers, have completed and put in operation a new plant at East River dock between Eighteenth and Nineteenth streets. The foundry is 75′x100′ equipped with three jib cranes, Colliau cupola and several pits for large square columns. The pattern and fitting shops and office building front on Nineteenth street.

James Chalmers.

The Unvarnished History of a Common Man.

BY W. EDWARD.

CHAPTER VI.

(CONTINUED FROM MARCH NUMBER.)

A HEARTY dinner, such as I had not eaten in a week, and a good rest brightened me up considerably and gave me courage to go out to look for work in earnest, for you must know that there is nothing so discouraging to a man as an empty stomach. In taking this step I knew that I had only put off the inevitable for a week at the most, and I was considerably worried in my mind, not only about how I was to pay my hotel bill, but what I was to do in the event that I could not find work of some kind within a week. I knew that I was reasonably safe for a week's board at the hotel before they presented their bill, as I went out regularly every morning about 8 o'clock and only came in to my meals, so that they would think I was employed; but I had only the promise of a job to rely on and it might be ten days or more before I could get started. In the meantime if the hotel people presented their bill I would have to confess that I did not have a dollar, and get out of it the best way I could.

For three days I walked up and down the city hunting in every nook and corner for work, not only in the foundries but wherever I thought there was a possibility of a job of any kind, but without success, when, purely by accident, I struck a job and got myself out of a rather awkward dilemma. You see I

didn't have as much experience then as I have now, or Cincinnati wouldn't have held me twenty-four hours.

I had gone into a shop for the third or fourth time to see if there was any show for a job and, while waiting for the foreman, a man came up and asked me if I knew where he could get a molder who would go with him into the country to run a small shop. I told him I was a molder in search of work and thought I could fill the bill. It only took us a few minutes to come to an agreement, as he was anxious to leave for home that evening and it appears he had had some trouble in getting men to bury themselves in a small country town for the sake of a job. This did not deter me, though, as I was heartily glad of the opportunity of getting away from the city. As soon as we concluded the agreement I explained my circumstances and asked him if he would advance me money enough to pay my hotel bill, which he readily agreed to do. The preliminaries being all arranged we left Cincinnati that evening.

Mr. Nelson, my employer, was the owner of a large plantation and several saw mills besides the machine shop and foundry, which was located at Belmont, Ky., a little town about 150 miles from Cincinnati. Part of the journey was by boat, then there was twenty miles by stage and the balance by rail, so that we did not reach there until the next afternoon and we were pretty well tired out with the long ride. Belmont was indeed a very small town and I wondered what a machine shop and foundry could get to do in such a place, but I soon found that there was plenty of work to be done and they evidently got good prices for the work.

Ever work in a country shop? Well, a man can hardly call himself an all round mechanic until he has run a small country shop, where they take in all kinds of work from a pound weight up to a piece weighing several tons, generally off a broken casting, without a crane or any of the conveniences which you imagine indispensible in a city shop. Here you have to do the work of a molder and core maker and melt your own metal, besides getting up your own rigging for getting out the work, with no one to consult who can give you any advice on the matter. Some of the city molders sneer at the little country shops, but I want to say that from my experience, there is more need of brains in running some of these little country shops successfully than there is in some of these big shops in the city. Everything here was of the most primitive kind and I had very few conveniences to aid me in getting out the work. The foundry was a frame building about 30x60 feet, with a blacksmith's forge and a small brass furnace in one end of it. There was no crane in the shop and the only way I had of hoisting anything was with a block and tackle. The cupola was a very small affair, and it was all the helper could do to get inside of it to chip it out. Then there was no core oven and I had to depend on the boiler flues to dry such cores as I needed, until I discovered that I could make use of the brass furnace for this purpose. I want to describe the brass furnace, because the man who built it must have been a genius. It was built of brick, about four feet long by three feet wide and five feet high. At one end was a grate which would hold about a bushel of coke, and the fire box was built up to within a foot of the roof. The bottom of the furnace sloped gradually from the opening into the fire box to the other end of the furnace, where there was an opening under which we set a heated ladle and wedged it up to place. Directly over this opening was the stack and there was a damper in it to regulate the draft. We run it with blast from the fan, and it was surprising how quick we could melt a heat of brass in this little furnace.

But the worst trouble I had was with the sand. It was so "close" that I had to vent even the smallest pieces, and with a piece of any size, especially if there were any green sand cores in it, I had to be very careful to get the vent off to keep it from blowing the roof off the shop. The manager gave me a hint of this the first day by telling me that the last molder they had worked for a week and when he came to pour off his work, lost every piece by the iron blow-

ing out as fast as he could pour it in. This put me on my guard and I was very careful in ramming and venting my work until I saw what the sand would stand.

The only help I had was an old colored man, the only man I have ever met who claimed the distinction of having been to heaven and returned to earth to tell about it. Not only had he been to heaven, but he had also been to the other place, and if his lurid account of all he saw is to be believed, I have no doubt of the warm welcome awaiting the wicked of this earth in the great hereafter. In his description of heaven he expiated on the bountiful supply of good things to eat, "'possum and sweet pertaties ebry day," "heabenly" music and golden streets—a niggers ideas of paradise. In his eyes I was an unregenerated sinner on the broad road to eternal ruin, and so earnest was the old man in this belief that instead of helping me when I wanted it, he would drop down on his knees in the sand and pray aloud for my soul's salvation. Whenever I wanted him for a lift and could not see him around the shop, I was sure to find him in the yard behind a pile of flasks praying in a loud, sonorous voice, while the tears rolled down his cheeks, for the Lord to have mercy on these "poo' mis'able white folks, who's so puffed up wid de vanity ob dere own conceit dat da kaint hea' de voice ob de Lawd callin' onto dem to tun fom da evil ways an' flee fom de wraf t'come." "Old" John filled the various positions of cupola tender, foundry helper and general blacksmith, besides running an old burr mill in which he ground corn meal for the proprietor's plantation hands. But as we seldom took off more than one heat a week, his labors were not very arduous and he found plenty of time for prayer.

Naturally you will think that we could only turn out small work and very little of that in a shop where there were so few facilities. Of course, our principal work was plow points and small repairs for sawmill, mine and farm machinery, but occasionally we would get in some heavy repair work and I always managed to get it out in good shape. I had everything my own way, as the manager was a machinist and didn't pretend to know anything about the foundry, so did not interfere with me in any way. Whenever I got ready to take off a heat, the rest of the plant was shut down and all hands were called to help in the foundry. This was where my snap came in, as I simply directed the work and the machinists and helpers poured the work and shook it out, unless I had anything in that I wanted to pour myself, so that I got out of the most disagreeable part of the work.

Everything went smoothly and for a time I was contented and happy. There were no amusements of any kind and the only thing which broke the monotony of the life was an occasional country dance and once a company of "barn stormers" cume to town. I spent most of my spare time in reading, as Mr. Nelson had an excellent library which he placed at my disposal, but even though a great reader the life soon began to pall on me, and the old desire to travel got the better of me. I stood it for four months and kept turning the matter over in my mind whether I should go or stay, until finally I came to the conclusion that life was too short to spend the best part of it in a little country town. As soon as I came to the conclusion to quit I was anxious to get away and made up my mind to give a week's notice of my intention to leave, on the following Saturday, when an event occurred which caused me to change my mind.

One day Mr. Nelson came in and asked me when I intended to take off a heat, explaining that some friends were visiting his family and they were anxious to see us cast, having never seen anything of the kind.

I told him we were to cast the next day, but I gave very little thought to the visitors, thinking they would be a lot of "yaps," as I called them, who would only be in the way.

I was just putting on the blast the next day, and had called the men in from the machine shop to assist me, when the proprietor came in with his wife and two young ladies whom he introduced to me as the Misses Strickland, cousins of his wife. Of course, I had to

show the young ladies around and explain all the details of my work, and I was so intent on this that "Old" John had to remind me to stop in the cupola. Neither of the girls had ever been in a foundry before and, of course were much interested in all they saw, and I was just as much interested in explaining every point to them. The oldest of the two sisters was about 20 years of age, with beautiful brown hair and eyes which lit up with intelligence and wonder as she watched us handling the hot iron. The younger was about 18 and just the opposite of her sister, a pronounced blonde, with blue eyes and a merry, playful disposition, while Belle was more serious.

Since I had left home I had known but few girls, and none to whom I had paid much attention, but there was something about Belle Strickland which attracted me at once and made me want to know her better. You may be sure that I did not give in my notice to quit on Saturday. In fact, I forgot all about my intention to leave, and for the next two days I thought of nothing else but how I should make an opportunity to meet her again.

It had been my custom for several months to go up to Mr. Nelson's on Saturday evening and get a book from his library to pass away the time on Sunday. Here was an opportunity to meet her, but for some reason I could not make up my mind to go there that evening, fearing they would think I was trying to force myself on their notice. The following morning I dressed myself with scrupulous care and went to church where I expected to see her. I was not disappointed in this, as they were all there in Mr. Nelson's pew, and I was rewarded by a smile of recognition as I walked down the aisle of the church. I had just received a new suit of clothes from Cincinnati and I was conscious of the fact that I was as well dressed as any of the young men around town, and flattered myself that I had made a favorable impression.

It was customary for the congregation to stand around in groups after the service was over, while the preacher passed from one to the other and shook hands with all, so as soon as the services were over I made my way to where Mr. Nelson and his family were standing, to pay my respects. I was a little surprised at the warm welcome I received from both of the girls, and more so when Mrs. Nelson asked me why I had failed to go up the night before, as she had intended asking me to dinner, but, she added, "if it is not too late now I want you to come to dinner and spend the day with us." You may be certain I did not decline that invitation and hardly knew how to thank her for giving me the opportunity I was so anxious for. Charley Clemmens, Mr. Nelson's book keeper, a young fellow about my own age, had been invited also, and the only thing which worried me as we walked up to the house was that Charley might monopolize Belle and leave the younger sister, Jessie, to me. But in this I was agreeably mistaken, as it was evident that the merry laugh of the frolicsome Jessie had more charms for Charley than the sedate Belle. After dinner, the weather being warm and pleasant, we all adjourned to a peach orchard where we spent a few hours lounging on the grass and eating the delicious fruit. Mr. Nelson and I soon grew interested in a discussion of some book which I had been reading, with Belle for an attentive auditor, while Mrs. Nelson, Jessie and Charley took a walk into the woods on the opposite side of the road. Mr. Nelson, having some business to attend to, soon went into the house, leaving Belle and I to entertain each other. Kentucky is noted for her beautiful women and Belle Strickland was no discredit to her native State. To the ordinary observer her sister might have been the more beautiful, but in my eyes she possessed something more than mere beauty of face and form—an inward beauty of character which reflected itself in every movement of her graceful head and in every flash of her expressive eyes. The afternoon and evening passed like a dream, and I believe that I was never more intensely happy in my life. I was wholly and completely in love, and the time came all too soon when I was forced to bid her good night.

(TO BE CONTINUED.)